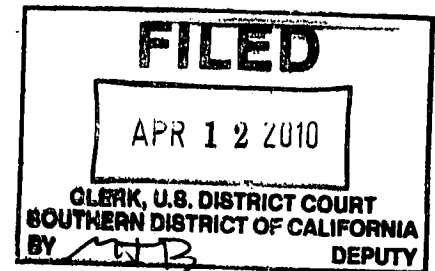


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ProtectConnect, Inc.



10 UNITED STATES DISTRICT COURT
11 SOUTHERN DISTRICT OF CALIFORNIA

12 PROTECTCONNECT, INC.,

13 Plaintiff,

14 v.

15 LEVITON MANUFACTURING CO., INC.,
16 EZE ROUGH SYSTEM, INC.,
17 COOPER WIRING DEVICES, INC.,
18 COOPER B-LINE, INC.,
19 HUBBELL, INC. (CONNECTICUT),
HUBBELL, INC. (DELAWARE),
PASS & SEYMOUR, INC., AND
CABLOFIL, INC.,

20 Defendants.

'10CV 0758

MMA RBB

Case No.

**PLAINTIFF PROTECTCONNECT,
INC.'S COMPLAINT FOR PATENT
INFRINGEMENT**

DEMAND FOR JURY TRIAL

21
22 Plaintiff ProtectConnect, Inc. ("ProtectConnect") complains and alleges as follows against
23 Defendants Cooper Wiring Devices, Inc., Cooper B-Line, Inc., Hubbell, Inc. (Connecticut),
24 Hubbell, Inc. (Delaware), Leviton Manufacturing Co., Inc., EZE Rough System, Inc., Pass &
25 Seymour, Inc., and Cablofil, Inc. ("Defendants"):

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THE PARTIES AND THE NATURE OF THIS ACTION

1
2 1. This is a complaint for patent infringement.

3 2. ProtectConnect was founded in 1999 and thereafter began developing innovative
4 “modular” wiring devices and systems—products that would represent a paradigm shift for the
5 electrical wiring industry. These modular wiring devices and modular wiring systems allow
6 contractors to simply snap into place electrical receptacles, switches, dimmers and other electrical
7 components during the final stages of industrial, commercial or residential construction while
8 traditional installation previously required time-consuming direct wiring of the devices to
9 electrical leads. The result is that these innovative products provide a quicker and safer
10 installation, which in turn results in significant labor cost savings and increased quality and
11 reliability.

12 3. ProtectConnect brought to market the first modular wiring device in 2003 and in
13 2004 brought to market its modular wiring systems. In addition, beginning in the year 2000,
14 ProtectConnect sought patent protection for its groundbreaking modular wiring innovations and
15 inventions and has since been granted a number of patents relating to this technology.

16 4. ProtectConnect and Defendants are competitors in the electrical wiring device and
17 system industry. For decades, Defendants marketed more traditional electrical wiring devices and
18 receptacles. Following ProtectConnect’s introduction of its modular wiring devices, Defendants
19 subsequently began making and selling their own lines of modular wiring devices and systems,
20 each of which utilize ProtectConnect’s patented technology.

21 5. Because Defendants are not in any way licensed to ProtectConnect’s intellectual
22 property, Defendants are all infringing ProtectConnect’s intellectual property rights.
23 ProtectConnect is entitled to compensation from Defendants for their patent infringement and to
24 an injunction against Defendants and their affiliates to halt their continued infringement and
25 unauthorized use of ProtectConnect’s patented technology. Specifically, ProtectConnect alleges
26 that the Defendants infringe the following patents: U.S. Patent No. 6,341,981, U.S. Patent No.
27 7,052,313, U.S. Patent No. 7,265,291, and U.S. Patent No. 7,367,121 (collectively, the “patents in
28 suit”).

1 6. ProtectConnect is a California corporation with its headquarters and principal
2 place of business located in San Diego, California and its corporate mailing address at PO Box
3 5605, Oceanside, CA 92052.

4 7. ProtectConnect is informed and believes, and thereon alleges, that Defendant
5 Cooper Wiring Devices, Inc. ("Cooper Wiring") is a company incorporated under the laws of
6 New York with its headquarters and principal place of business located at 203 Cooper Circle,
7 Peachtree City, Georgia 30269. ProtectConnect is informed and believes, and thereon alleges,
8 that Cooper Wiring is an affiliate of Cooper B-Line, Inc.

9 8. ProtectConnect is informed and believes, and thereon alleges, that Defendant
10 Cooper B-Line, Inc. ("Cooper B-Line") is a company incorporated under the laws of Delaware
11 with its headquarters and principal place of business located at 509 W. Monroe Street, Highland,
12 Illinois 62249. ProtectConnect is informed and believes, and thereon alleges, that Cooper B-Line
13 is an affiliate of Cooper Wiring.

14 9. ProtectConnect is informed and believes, and thereon alleges, that Defendant
15 Hubbell, Inc. (Connecticut) ("Hubbell Connecticut") is a company incorporated under the laws of
16 Connecticut with its headquarters and principal place of business located at 584 Derby Milford
17 Road, Orange, Connecticut 06477. ProtectConnect is informed and believes, and thereon alleges,
18 that Hubbell Connecticut is an affiliate of Hubbell, Inc. (Delaware).

19 10. ProtectConnect is informed and believes, and thereon alleges, that Defendant
20 Hubbell, Inc. (Delaware) ("Hubbell Delaware") is a company incorporated under the laws of
21 Delaware with its headquarters and principal place of business located at 3902 W Sample Street,
22 South Bend, Indiana 46619. ProtectConnect is informed and believes, and thereon alleges, that
23 Hubbell Delaware is an affiliate of Hubbell Connecticut.

24 11. ProtectConnect is informed and believes, and thereon alleges, that Defendant
25 Leviton Manufacturing Co., Inc. ("Leviton") is a company incorporated under the laws of
26 Delaware with its headquarters and principal place of business located at 201 N. Service Road,
27 Melville, New York 11747. ProtectConnect is informed and believes, and thereon alleges, that
28 Leviton is an affiliate of EZE Rough System, Inc.

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1 State of California and the Southern District of California. In addition, this Court has personal
2 jurisdiction over each Defendant because, on information and belief, this lawsuit arises out of
3 each Defendant's form related activities including without limitation each Defendant's making,
4 using, selling and/or offering to sell infringing products in the State of California and the
5 Southern District of California. Finally, this Court has personal jurisdiction over each Defendant
6 because, on information and belief, each Defendant has made, used, sold and offered for sale its
7 infringing products and placed such infringing products in the stream of interstate commerce with
8 the expectation that such infringing products would be made, used, sold and/or offered for sale
9 within the State of California and the Southern District of California.

10 18. Venue is proper in this district pursuant to 28 U.S.C. §§ 1391 and 1400 because a
11 substantial part of the events or omissions giving rise to ProtectConnect's claims occurred in this
12 district, Defendants each have committed acts of infringement to the harm of ProtectConnect in
13 this district and Defendants each are subject to personal jurisdiction at the time of commencement
14 of this action in this district.

15 **FIRST CLAIM FOR RELIEF**

16 **(Infringement of U.S. Patent No. 6,341,981)**

17 19. ProtectConnect incorporates and realleges paragraphs 1-18 as if fully set forth
18 herein.

19 20. On January 29, 2002, United States Patent No. 6,341,981 (the '981 patent"),
20 entitled "Safety Electrical Outlet and Switch System" was duly and legally issued by the United
21 States Patent and Trademark Office. The named inventor is Michael P. Gorman. ProtectConnect
22 is the assignee and owner of the entire right, title and interest in and to the '981 patent.
23 Accordingly, ProtectConnect has the right to bring this suit for damages and injunctive relief. A
24 true and correct copy of the '981 patent is attached hereto as Exhibit A.

25 **A. The Leviton Defendants.**

26 21. On information and belief, Defendants Leviton Manufacturing Co., Inc. and EZE
27 Rough System, Inc. (the "Leviton Defendants"), and their agents, are infringing the '981 patent
28 by making, using, offering for sale, and/or selling within the United States devices that embody

1 the inventions disclosed and claimed in the '981 patent, and/or by importing into the United
2 States devices that embody the inventions disclosed and claimed in the '981 patent. On
3 information and belief, at least the following Leviton Defendants' products, alone and/or in
4 combination with other products, directly infringe the claims of the '981 patent: Lev-Lok
5 Modular Receptacle System and/or PowerMount with Lev-Lok products.

6 22. By way of example and not limitation, the Leviton Defendants' Lev-Lok Modular
7 Receptacle System and/or PowerMount with Lev-Lok products, alone and/or in combination with
8 other products, practice each of the limitations of at least independent claim 34 of the '981 patent.
9 Lev-Lok Modular Receptacle System and/or PowerMount with Lev-Lok products are made, used,
10 sold, offered for sale, and/or imported by the Leviton Defendants in the United States without
11 authorization from ProtectConnect. Therefore, Lev-Lok Modular Receptacle System and/or
12 PowerMount with Lev-Lok products infringe said claim.

13 23. In addition to direct infringement, ProtectConnect is informed and believes, and
14 on that basis alleges, that the Leviton Defendants have induced and contributed to infringement
15 by others of the '981 patent. By way of example and not limitation, the Leviton Defendants offer
16 to sell and/or sell within the United States to their customers or import into the United States
17 components of patented devices knowing the same to be especially made or especially adapted
18 for use in an infringement of the '981 patent. Such components are not staple articles or
19 commodities of commerce suitable for substantial noninfringing use. On information and belief,
20 the Leviton Defendants also actively induce infringement of the '981 patent by their customers
21 and/or others.

22 24. Based upon information and belief, the Leviton Defendants have notice of the '981
23 patent. In addition, the Leviton Defendants were provided constructive notice of the '981 patent
24 by virtue of ProtectConnect's marking of its products.

25 25. On information and belief, the Leviton Defendants' infringement of the '981
26 patent has been willful.

27 26. As a result of the Leviton Defendants' acts of infringement, ProtectConnect has
28 suffered and will continue to suffer damages in an amount to be proven at trial.

1 27. ProtectConnect has been irreparably harmed by the Leviton Defendants' acts of
2 infringement, and will continue to be harmed unless and until the Leviton Defendants' acts of
3 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
4 remedy at law and is entitled to a preliminary and permanent injunction against the Leviton
5 Defendants and their infringing products.

6 28. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

7 **B. The Hubbell Defendants.**

8 29. On information and belief, Defendants Hubbell, Inc. (Connecticut) and Hubbell,
9 Inc. (Delaware) (the "Hubbell Defendants"), and their agents, are infringing the '981 patent by
10 making, using, offering for sale, and/or selling within the United States devices that embody the
11 inventions disclosed and claimed in the '981 patent, and/or by importing into the United States
12 devices that embody the inventions disclosed and claimed in the '981 patent. On information and
13 belief, at least the following Hubbell Defendants' products, alone and/or in combination with
14 other products, directly infringe the claims of the '981 patent: SNAPConnect.

15 30. By way of example and not limitation, the Hubbell Defendants' SNAPConnect
16 products, alone and/or in combination with other products, practice each of the limitations of at
17 least independent claim 34 of the '981 patent. SNAPConnect products are made, used, sold,
18 offered for sale, and/or imported by the Hubbell Defendants in the United States without
19 authorization from ProtectConnect. Therefore, SNAPConnect products infringe at least said
20 claim.

21 31. In addition to direct infringement, ProtectConnect is informed and believes, and
22 on that basis alleges, that the Hubbell Defendants have induced and contributed to infringement
23 by others of the '981 patent. By way of example and not limitation, the Hubbell Defendants offer
24 to sell and/or sell within the United States to its customers or import into the United States
25 components of patented devices knowing the same to be especially made or especially adapted
26 for use in an infringement of the '981 patent. Such components are not staple articles or
27 commodities of commerce suitable for substantial noninfringing use. On information and belief,

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1 the Hubbell Defendants also actively induce infringement of the '981 patent by their customers
2 and/or others.

3 32. Based upon information and belief, the Hubbell Defendants have notice of the
4 '981 patent. In addition, the Hubbell Defendants were provided constructive notice of the '981
5 patent by virtue of ProtectConnect's marking of its products.

6 33. On information and belief, the Hubbell Defendants' infringement of the '981
7 patent has been willful.

8 34. As a result of the Hubbell Defendants' acts of infringement, ProtectConnect has
9 suffered and will continue to suffer damages in an amount to be proven at trial.

10 35. ProtectConnect has been irreparably harmed by the Hubbell Defendants' acts of
11 infringement, and will continue to be harmed unless and until the Hubbell Defendants' acts of
12 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
13 remedy at law and is entitled to a preliminary and permanent injunction against the Hubbell
14 Defendants and their infringing products.

15 36. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

16 **C. The Cooper Defendants.**

17 37. On information and belief, Defendants Cooper Wiring Devices, Inc. and Cooper
18 B-Line, Inc. (collectively, the "Cooper Defendants"), and their agents, are each infringing the
19 '981 patent by making, using, offering for sale, and/or selling within the United States devices
20 that embody the inventions disclosed and claimed in the '981 patent, and/or by importing into the
21 United States devices that embody the inventions disclosed and claimed in the '981 patent. On
22 information and belief, at least the following Cooper Defendants' products, alone and/or in
23 combination with other products, directly infringe the claims of the '981 patent: Arrowlink
24 Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with Arrowlink.

25 38. By way of example and not limitation, the Cooper Defendants' Arrowlink
26 Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with Arrowlink, alone and/or in
27 combination with other products, practice each of the limitations of at least independent claim 34
28 of the '981 patent. Arrowlink Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with

1 Arrowlink are made, used, sold, offered for sale, and/or imported by the Cooper Defendants in the
2 United States without authorization from ProtectConnect. Therefore, Arrowlink Modular Wiring
3 Devices and/or Ruff-In Pre-Fab Systems with Arrowlink infringe at least said claim.

4 39. In addition to direct infringement, ProtectConnect is informed and believes, and
5 on that basis alleges, that the Cooper Defendants have induced and contributed to infringement by
6 others of the '981 patent. By way of example and not limitation, the Cooper Defendants offer to
7 sell and/or sell within the United States to their customers or import into the United States
8 components of patented devices knowing the same to be especially made or especially adapted
9 for use in an infringement of the '981 patent. Such components are not staple articles or
10 commodities of commerce suitable for substantial noninfringing use. On information and belief,
11 the Cooper Defendants also actively induce infringement of the '981 patent by their customers
12 and/or other downstream users of its Arrowlink Modular Wiring Devices and/or Ruff-In Pre-Fab
13 Systems with Arrowlink products.

14 40. Based upon information and belief, the Cooper Defendants have notice of the '981
15 patent. In addition, the Cooper Defendants were provided constructive notice of the '981 patent
16 by virtue of ProtectConnect's marking of its products.

17 41. On information and belief, the Cooper Defendants' infringement of the '981 patent
18 has been willful.

19 42. As a result of the Cooper Defendants' acts of infringement, ProtectConnect has
20 suffered and will continue to suffer damages in an amount to be proven at trial.

21 43. ProtectConnect has been irreparably harmed by the Cooper Defendants' acts of
22 infringement, and will continue to be harmed unless and until the Cooper Defendants' acts of
23 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
24 remedy at law and is entitled to a preliminary and permanent injunction against the Cooper
25 Defendants and their infringing products.

26 44. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

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D. The Pass & Seymour Defendants.

45. On information and belief, Defendants Pass & Seymour, Inc. and Cablofil, Inc. (the "Pass & Seymour Defendants"), and their agents, are infringing the '981 patent by making, using, offering for sale, and/or selling within the United States devices that embody the inventions disclosed and claimed in the '981 patent, and/or by importing into the United States devices that embody the inventions disclosed and claimed in the '981 patent. On information and belief, at least the following Pass & Seymour Defendants' products, alone and/or in combination with other products, directly infringe the claims of the '981 patent: PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems, and/or FAS Power Pre-fabricated Wiring Assemblies.

46. By way of example and not limitation, Pass & Seymour Defendants' PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems, and/or FAS Power Pre-fabricated Wiring Assemblies, alone and/or in combination with other products, practice each of the limitations of at least independent claim 34 of the '981 patent. PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems and/or FAS Power Pre-fabricated Wiring Assemblies are made, used, sold, offered for sale, and/or imported by the Pass & Seymour Defendants in the United States without authorization from ProtectConnect. Therefore, PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems and/or FAS Power Pre-fabricated Wiring Assemblies infringe said claim.

47. In addition to direct infringement, ProtectConnect is informed and believes, and on that basis alleges, that the Pass & Seymour Defendants have induced and contributed to infringement by others of the '981 patent. By way of example and not limitation, the Pass & Seymour Defendants offer to sell and/or sell within the United States to their customers or import into the United States components of patented devices knowing the same to be especially made or especially adapted for use in an infringement of the '981 patent. Such components are not staple articles or commodities of commerce suitable for substantial noninfringing use. On information

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1 and belief, the Pass & Seymour Defendants also actively induce infringement of the '981 patent
2 by their customers and/or others.

3 48. Based upon information and belief, the Pass & Seymour Defendants have notice of
4 the '981 patent. In addition, the Pass & Seymour Defendants were provided constructive notice
5 of the '981 patent by virtue of ProtectConnect's marking of its products.

6 49. On information and belief, the Pass & Seymour Defendants' infringement of the
7 '981 patent has been willful.

8 50. As a result of the Pass & Seymour Defendants' acts of infringement,
9 ProtectConnect has suffered and will continue to suffer damages in an amount to be proven at
10 trial.

11 51. ProtectConnect has been irreparably harmed by the Pass & Seymour Defendants'
12 acts of infringement, and will continue to be harmed unless and until the Pass & Seymour
13 Defendants' acts of infringement are enjoined and restrained by order of this Court.
14 ProtectConnect has no adequate remedy at law and is entitled to a preliminary and permanent
15 injunction against the Pass & Seymour Defendants and their infringing products.

16 52. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285 and
17 ProtectConnect is entitled to an award of attorneys' fees.

18 **SECOND CLAIM FOR RELIEF**

19 **(Infringement of U.S. Patent No. 7,052,313)**

20 53. ProtectConnect incorporates and realleges paragraphs 1-18 as if fully set forth
21 herein.

22 54. On May 30, 2006, United States Patent No. 7,052,313 (the '313 patent"), entitled
23 "Electrical Distribution Wiring Module" was duly and legally issued by the United States Patent
24 and Trademark Office. The named inventor is Michael P. Gorman. ProtectConnect is the
25 assignee and owner of the entire right, title and interest in and to the '313 patent. Accordingly,
26 ProtectConnect has the right to bring this suit for damages and injunctive relief. A true and
27 correct copy of the '313 patent is attached hereto as Exhibit B.

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1 55. United States Patent Application Serial No. 11/110,351 was published by the
2 United States Patent and Trademark Office on December 8, 2005 as United States Patent
3 Application Publication No. US 2005/0272304 (the "Published '304 Application"), and issued as
4 the '313 patent with at least one claim in substantially identical form to the claims as published.
5 A copy of the Published '304 Application is attached as Exhibit C.

6 **A. The Leviton Defendants.**

7 56. On information and belief, Defendants Leviton Manufacturing Co., Inc. and EZE
8 Rough System, Inc. (the "Leviton Defendants"), and their agents, are infringing the '313 patent
9 by making, using, offering for sale, and/or selling within the United States devices that embody
10 the inventions disclosed and claimed in the '313 patent, and/or by importing into the United
11 States devices that embody the inventions disclosed and claimed in the '313 patent. On
12 information and belief, at least the following Leviton Defendants' products, alone and/or in
13 combination with other products, directly infringe the claims of the '313 patent: Lev-Lok
14 Modular Receptacle System and/or PowerMount with Lev-Lok products.

15 57. By way of example and not limitation, the Leviton Defendants' Lev-Lok Modular
16 Receptacle System and/or PowerMount with Lev-Lok products, alone and/or in combination with
17 other products, practice each of the limitations of at least independent claim 3 of the '313 patent.
18 Lev-Lok Modular Receptacle System and/or PowerMount with Lev-Lok products are made, used,
19 sold, offered for sale, and/or imported by the Leviton Defendants in the United States without
20 authorization from ProtectConnect. Therefore, Lev-Lok Modular Receptacle System and/or
21 PowerMount with Lev-Lok products infringe said claim.

22 58. In addition to direct infringement, ProtectConnect is informed and believes, and
23 on that basis alleges, that the Leviton Defendants have induced and contributed to infringement
24 by others of the '313 patent. By way of example and not limitation, the Leviton Defendants offer
25 to sell and/or sell within the United States to their customers or import into the United States
26 components of patented devices knowing the same to be especially made or especially adapted
27 for use in an infringement of the '313 patent. Such components are not staple articles or
28 commodities of commerce suitable for substantial noninfringing use. On information and belief,

1 the Leviton Defendants also actively induce infringement of the '313 patent by their customers
2 and/or others.

3 59. Based upon information and belief, the Leviton Defendants have notice of the '313
4 patent.

5 60. On information and belief, the Leviton Defendants' infringement of the '313
6 patent has been willful.

7 61. As a result of the Leviton Defendants' acts of infringement, ProtectConnect has
8 suffered and will continue to suffer damages in an amount to be proven at trial.

9 62. ProtectConnect has been irreparably harmed by the Leviton Defendants' acts of
10 infringement, and will continue to be harmed unless and until the Leviton Defendants' acts of
11 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
12 remedy at law and is entitled to a preliminary and permanent injunction against the Leviton
13 Defendants and their infringing products.

14 63. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

15 **B. The Hubbell Defendants.**

16 64. On information and belief, Defendants Hubbell, Inc. (Connecticut) and Hubbell,
17 Inc. (Delaware) (the "Hubbell Defendants"), and their agents, are infringing the '313 patent by
18 making, using, offering for sale, and/or selling within the United States devices that embody the
19 inventions disclosed and claimed in the '313 patent, and/or by importing into the United States
20 devices that embody the inventions disclosed and claimed in the '313 patent. On information and
21 belief, at least the following Hubbell Defendants' products, alone and/or in combination with
22 other products, directly infringe the claims of the '313 patent: SNAPConnect.

23 65. By way of example and not limitation, the Hubbell Defendants' SNAPConnect
24 products, alone and/or in combination with other products, practice each of the limitations of at
25 least independent claim 3 of the '313 patent. SNAPConnect products are made, used, sold,
26 offered for sale, and/or imported by the Hubbell Defendants in the United States without
27 authorization from ProtectConnect. Therefore, SNAPConnect products infringe at least said
28 claim.

1 66. In addition to direct infringement, ProtectConnect is informed and believes, and
2 on that basis alleges, that the Hubbell Defendants have induced and contributed to infringement
3 by others of the '313 patent. By way of example and not limitation, the Hubbell Defendants offer
4 to sell and/or sell within the United States to its customers or import into the United States
5 components of patented devices knowing the same to be especially made or especially adapted
6 for use in an infringement of the '313 patent. Such components are not staple articles or
7 commodities of commerce suitable for substantial noninfringing use. On information and belief,
8 the Hubbell Defendants also actively induce infringement of the '313 patent by their customers
9 and/or others.

10 67. Based upon information and belief, the Hubbell Defendants have notice of the
11 '313 patent.

12 68. On information and belief, the Hubbell Defendants' infringement of the '313
13 patent has been willful.

14 69. As a result of the Hubbell Defendants' acts of infringement, ProtectConnect has
15 suffered and will continue to suffer damages in an amount to be proven at trial.

16 70. ProtectConnect has been irreparably harmed by the Hubbell Defendants' acts of
17 infringement, and will continue to be harmed unless and until the Hubbell Defendants' acts of
18 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
19 remedy at law and is entitled to a preliminary and permanent injunction against the Hubbell
20 Defendants and their infringing products.

21 71. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

22 **C. The Cooper Defendants.**

23 72. On information and belief, Defendants Cooper Wiring Devices, Inc. and Cooper
24 B-Line, Inc. (collectively, the "Cooper Defendants"), and their agents, are each infringing the
25 '313 patent by making, using, offering for sale, and/or selling within the United States devices
26 that embody the inventions disclosed and claimed in the '313 patent, and/or by importing into the
27 United States devices that embody the inventions disclosed and claimed in the '313 patent. On
28 information and belief, at least the following Cooper Defendants' products, alone and/or in

1 combination with other products, directly infringe the claims of the '313 patent: Arrowlink
2 Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with Arrowlink.

3 73. By way of example and not limitation, the Cooper Defendants' Arrowlink
4 Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with Arrowlink, alone and/or in
5 combination with other products, practice each of the limitations of at least independent claim 3
6 of the '313 patent. Arrowlink Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with
7 Arrowlink are made, used, sold, offered for sale, and/or imported by the Cooper Defendants in the
8 United States without authorization from ProtectConnect. Therefore, Arrowlink Modular Wiring
9 Devices and/or Ruff-In Pre-Fab Systems with Arrowlink infringe at least said claim.

10 74. In addition to direct infringement, ProtectConnect is informed and believes, and
11 on that basis alleges, that the Cooper Defendants have induced and contributed to infringement by
12 others of the '313 patent. By way of example and not limitation, the Cooper Defendants offer to
13 sell and/or sell within the United States to their customers or import into the United States
14 components of patented devices knowing the same to be especially made or especially adapted
15 for use in an infringement of the '313 patent. Such components are not staple articles or
16 commodities of commerce suitable for substantial noninfringing use. On information and belief,
17 the Cooper Defendants also actively induce infringement of the '313 patent by their customers
18 and/or other downstream users of its Arrowlink Modular Wiring Devices and/or Ruff-In Pre-Fab
19 Systems with Arrowlink products.

20 75. Based upon information and belief, the Cooper Defendants have notice of the '313
21 patent.

22 76. On information and belief, the Cooper Defendants' infringement of the '313 patent
23 has been willful.

24 77. As a result of the Cooper Defendants' acts of infringement, ProtectConnect has
25 suffered and will continue to suffer damages in an amount to be proven at trial.

26 78. ProtectConnect has been irreparably harmed by the Cooper Defendants' acts of
27 infringement, and will continue to be harmed unless and until the Cooper Defendants' acts of
28 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate

1 remedy at law and is entitled to a preliminary and permanent injunction against the Cooper
2 Defendants and their infringing products.

3 79. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

4 **D. The Pass & Seymour Defendants.**

5 80. On information and belief, Defendants Pass & Seymour, Inc. and Cablofil, Inc.
6 (the "Pass & Seymour Defendants"), and their agents, are infringing the '313 patent by making,
7 using, offering for sale, and/or selling within the United States devices that embody the
8 inventions disclosed and claimed in the '313 patent, and/or by importing into the United States
9 devices that embody the inventions disclosed and claimed in the '313 patent. On information and
10 belief, at least the following Pass & Seymour Defendants' products, alone and/or in combination
11 with other products, directly infringe the claims of the '313 patent: PlugTail Wiring Devices,
12 PlugTail Power Pre-Fabricated Wiring Assemblies and Systems, and/or FAS Power Pre-
13 fabricated Wiring Assemblies.

14 81. By way of example and not limitation, Pass & Seymour Defendants' PlugTail
15 Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems, and/or FAS
16 Power Pre-fabricated Wiring Assemblies, alone and/or in combination with other products,
17 practice each of the limitations of at least independent claim 3 of the '313 patent. PlugTail
18 Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems and/or FAS
19 Power Pre-fabricated Wiring Assemblies are made, used, sold, offered for sale, and/or imported
20 by the Pass & Seymour Defendants in the United States without authorization from
21 ProtectConnect. Therefore, PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring
22 Assemblies and Systems and/or FAS Power Pre-fabricated Wiring Assemblies infringe said
23 claim.

24 82. In addition to direct infringement, ProtectConnect is informed and believes, and
25 on that basis alleges, that the Pass & Seymour Defendants have induced and contributed to
26 infringement by others of the '313 patent. By way of example and not limitation, the Pass &
27 Seymour Defendants offer to sell and/or sell within the United States to their customers or import
28 into the United States components of patented devices knowing the same to be especially made or

1 especially adapted for use in an infringement of the '313 patent. Such components are not staple
 2 articles or commodities of commerce suitable for substantial noninfringing use. On information
 3 and belief, the Pass & Seymour Defendants also actively induce infringement of the '313 patent
 4 by their customers and/or others.

5 83. Based upon information and belief, the Pass & Seymour Defendants have notice of
 6 the '313 patent.

7 84. On information and belief, the Pass & Seymour Defendants' infringement of the
 8 '313 patent has been willful.

9 85. As a result of the Pass & Seymour Defendants' acts of infringement,
 10 ProtectConnect has suffered and will continue to suffer damages in an amount to be proven at
 11 trial.

12 86. ProtectConnect has been irreparably harmed by the Pass & Seymour Defendants'
 13 acts of infringement, and will continue to be harmed unless and until the Pass & Seymour
 14 Defendants' acts of infringement are enjoined and restrained by order of this Court.
 15 ProtectConnect has no adequate remedy at law and is entitled to a preliminary and permanent
 16 injunction against the Pass & Seymour Defendants and their infringing products.

17 87. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285 and
 18 ProtectConnect is entitled to an award of attorneys' fees.

19 **THIRD CLAIM FOR RELIEF**

20 **(Infringement of U.S. Patent No. 7,265,291)**

21 88. ProtectConnect incorporates and realleges paragraphs 1-18 as if fully set forth
 22 herein.

23 89. On September 4, 2007, United States Patent No. 7,265,291 (the '291 patent"),
 24 entitled "Electrical Distribution Wiring Module" was duly and legally issued by the United States
 25 Patent and Trademark Office. The named inventor is Michael P. Gorman. ProtectConnect is the
 26 assignee and owner of the entire right, title and interest in and to the '291 patent. Accordingly,
 27 ProtectConnect has the right to bring this suit for damages and injunctive relief. A true and
 28 correct copy of the '291 patent is attached hereto as Exhibit D.

A. The Leviton Defendants.

90. On information and belief, Defendants Leviton Manufacturing Co., Inc. and EZE Rough System, Inc. (the "Leviton Defendants"), and their agents, are infringing the '291 patent by making, using, offering for sale, and/or selling within the United States devices that embody the inventions disclosed and claimed in the '291 patent, and/or by importing into the United States devices that embody the inventions disclosed and claimed in the '291 patent. On information and belief, at least the following Leviton Defendants' products, alone and/or in combination with other products, directly infringe the claims of the '291 patent: Lev-Lok Modular Receptacle System and/or PowerMount with Lev-Lok products.

91. By way of example and not limitation, the Leviton Defendants' Lev-Lok Modular Receptacle System and/or PowerMount with Lev-Lok products, alone and/or in combination with other products, practice each of the limitations of at least independent claim 1 of the '291 patent. Lev-Lok Modular Receptacle System and/or PowerMount with Lev-Lok products are made, used, sold, offered for sale, and/or imported by the Leviton Defendants in the United States without authorization from ProtectConnect. Therefore, Lev-Lok Modular Receptacle System and/or PowerMount with Lev-Lok products infringe said claim.

92. In addition to direct infringement, ProtectConnect is informed and believes, and on that basis alleges, that the Leviton Defendants have induced and contributed to infringement by others of the '291 patent. By way of example and not limitation, the Leviton Defendants offer to sell and/or sell within the United States to their customers or import into the United States components of patented devices knowing the same to be especially made or especially adapted for use in an infringement of the '291 patent. Such components are not staple articles or commodities of commerce suitable for substantial noninfringing use. On information and belief, the Leviton Defendants also actively induce infringement of the '291 patent by their customers and/or others.

93. Based upon information and belief, the Leviton Defendants have notice of the '291 patent.

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1 94. On information and belief, the Leviton Defendants' infringement of the '291
2 patent has been willful.

3 95. As a result of the Leviton Defendants' acts of infringement, ProtectConnect has
4 suffered and will continue to suffer damages in an amount to be proven at trial.

5 96. ProtectConnect has been irreparably harmed by the Leviton Defendants' acts of
6 infringement, and will continue to be harmed unless and until the Leviton Defendants' acts of
7 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
8 remedy at law and is entitled to a preliminary and permanent injunction against the Leviton
9 Defendants and their infringing products.

10 97. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

11 **B. The Hubbell Defendants.**

12 98. On information and belief, Defendants Hubbell, Inc. (Connecticut) and Hubbell,
13 Inc. (Delaware) (the "Hubbell Defendants"), and their agents, are infringing the '291 patent by
14 making, using, offering for sale, and/or selling within the United States devices that embody the
15 inventions disclosed and claimed in the '291 patent, and/or by importing into the United States
16 devices that embody the inventions disclosed and claimed in the '291 patent. On information and
17 belief, at least the following Hubbell Defendants' products, alone and/or in combination with
18 other products, directly infringe the claims of the '291 patent: SNAPConnect.

19 99. By way of example and not limitation, the Hubbell Defendants' SNAPConnect
20 products, alone and/or in combination with other products, practice each of the limitations of at
21 least independent claim 1 of the '291 patent. SNAPConnect products are made, used, sold,
22 offered for sale, and/or imported by the Hubbell Defendants in the United States without
23 authorization from ProtectConnect. Therefore, SNAPConnect products infringe at least said
24 claim.

25 100. In addition to direct infringement, ProtectConnect is informed and believes, and
26 on that basis alleges, that the Hubbell Defendants have induced and contributed to infringement
27 by others of the '291 patent. By way of example and not limitation, the Hubbell Defendants offer
28 to sell and/or sell within the United States to its customers or import into the United States

1 components of patented devices knowing the same to be especially made or especially adapted
2 for use in an infringement of the '291 patent. Such components are not staple articles or
3 commodities of commerce suitable for substantial noninfringing use. On information and belief,
4 the Hubbell Defendants also actively induce infringement of the '291 patent by their customers
5 and/or others.

6 101. Based upon information and belief, the Hubbell Defendants have notice of the
7 '291 patent.

8 102. On information and belief, the Hubbell Defendants' infringement of the '291
9 patent has been willful.

10 103. As a result of the Hubbell Defendants' acts of infringement, ProtectConnect has
11 suffered and will continue to suffer damages in an amount to be proven at trial.

12 104. ProtectConnect has been irreparably harmed by the Hubbell Defendants' acts of
13 infringement, and will continue to be harmed unless and until the Hubbell Defendants' acts of
14 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
15 remedy at law and is entitled to a preliminary and permanent injunction against the Hubbell
16 Defendants and their infringing products.

17 105. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

18 **C. The Cooper Defendants.**

19 106. On information and belief, Defendants Cooper Wiring Devices, Inc. and Cooper
20 B-Line, Inc. (collectively, the "Cooper Defendants"), and their agents, are each infringing the
21 '291 patent by making, using, offering for sale, and/or selling within the United States devices
22 that embody the inventions disclosed and claimed in the '291 patent, and/or by importing into the
23 United States devices that embody the inventions disclosed and claimed in the '291 patent. On
24 information and belief, at least the following Cooper Defendants' products, alone and/or in
25 combination with other products, directly infringe the claims of the '291 patent: Arrowlink
26 Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with Arrowlink.

27 107. By way of example and not limitation, the Cooper Defendants' Arrowlink
28 Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with Arrowlink, alone and/or in

1 combination with other products, practice each of the limitations of at least independent claim 1
2 of the '291 patent. Arrowlink Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with
3 Arrowlink are made, used, sold, offered for sale, and/or imported by the Cooper Defendants in the
4 United States without authorization from ProtectConnect. Therefore, Arrowlink Modular Wiring
5 Devices and/or Ruff-In Pre-Fab Systems with Arrowlink infringe at least said claim.

6 108. In addition to direct infringement, ProtectConnect is informed and believes, and
7 on that basis alleges, that the Cooper Defendants have induced and contributed to infringement by
8 others of the '291 patent. By way of example and not limitation, the Cooper Defendants offer to
9 sell and/or sell within the United States to their customers or import into the United States
10 components of patented devices knowing the same to be especially made or especially adapted
11 for use in an infringement of the '291 patent. Such components are not staple articles or
12 commodities of commerce suitable for substantial noninfringing use. On information and belief,
13 the Cooper Defendants also actively induce infringement of the '291 patent by their customers
14 and/or other downstream users of its Arrowlink Modular Wiring Devices and/or Ruff-In Pre-Fab
15 Systems with Arrowlink products.

16 109. Based upon information and belief, the Cooper Defendants have notice of the '291
17 patent.

18 110. On information and belief, the Cooper Defendants' infringement of the '291 patent
19 has been willful.

20 111. As a result of the Cooper Defendants' acts of infringement, ProtectConnect has
21 suffered and will continue to suffer damages in an amount to be proven at trial.

22 112. ProtectConnect has been irreparably harmed by the Cooper Defendants' acts of
23 infringement, and will continue to be harmed unless and until the Cooper Defendants' acts of
24 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
25 remedy at law and is entitled to a preliminary and permanent injunction against the Cooper
26 Defendants and their infringing products.

27 113. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

28 /////

D. The Pass & Seymour Defendants.

114. On information and belief, Defendants Pass & Seymour, Inc. and Cablofil, Inc. (the "Pass & Seymour Defendants"), and their agents, are infringing the '291 patent by making, using, offering for sale, and/or selling within the United States devices that embody the inventions disclosed and claimed in the '291 patent, and/or by importing into the United States devices that embody the inventions disclosed and claimed in the '291 patent. On information and belief, at least the following Pass & Seymour Defendants' products, alone and/or in combination with other products, directly infringe the claims of the '291 patent: PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems, and/or FAS Power Pre-fabricated Wiring Assemblies.

115. By way of example and not limitation, Pass & Seymour Defendants' PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems, and/or FAS Power Pre-fabricated Wiring Assemblies, alone and/or in combination with other products, practice each of the limitations of at least independent claim 1 of the '291 patent. PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems and/or FAS Power Pre-fabricated Wiring Assemblies are made, used, sold, offered for sale, and/or imported by the Pass & Seymour Defendants in the United States without authorization from ProtectConnect. Therefore, PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems and/or FAS Power Pre-fabricated Wiring Assemblies infringe said claim.

116. In addition to direct infringement, ProtectConnect is informed and believes, and on that basis alleges, that the Pass & Seymour Defendants have induced and contributed to infringement by others of the '291 patent. By way of example and not limitation, the Pass & Seymour Defendants offer to sell and/or sell within the United States to their customers or import into the United States components of patented devices knowing the same to be especially made or especially adapted for use in an infringement of the '291 patent. Such components are not staple articles or commodities of commerce suitable for substantial noninfringing use. On information

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1 and belief, the Pass & Seymour Defendants also actively induce infringement of the '291 patent
2 by their customers and/or others.

3 117. Based upon information and belief, the Pass & Seymour Defendants have notice of
4 the '291 patent.

5 118. On information and belief, the Pass & Seymour Defendants' infringement of the
6 '291 patent has been willful.

7 119. As a result of the Pass & Seymour Defendants' acts of infringement,
8 ProtectConnect has suffered and will continue to suffer damages in an amount to be proven at
9 trial.

10 120. ProtectConnect has been irreparably harmed by the Pass & Seymour Defendants'
11 acts of infringement, and will continue to be harmed unless and until the Pass & Seymour
12 Defendants' acts of infringement are enjoined and restrained by order of this Court.
13 ProtectConnect has no adequate remedy at law and is entitled to a preliminary and permanent
14 injunction against the Pass & Seymour Defendants and their infringing products.

15 121. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285 and
16 ProtectConnect is entitled to an award of attorneys' fees.

17 **FOURTH CLAIM FOR RELIEF**

18 **(Infringement of U.S. Patent No. 7,367,121)**

19 122. ProtectConnect incorporates and realleges paragraphs 1-18 as if fully set forth
20 herein.

21 123. On May 6, 2008, United States Patent No. 7,367,121 (the '121 patent"), entitled
22 "Electrical Wiring Method" was duly and legally issued by the United States Patent and
23 Trademark Office. The named inventor is Michael P. Gorman. ProtectConnect is the assignee
24 and owner of the entire right, title and interest in and to the '121 patent. Accordingly,
25 ProtectConnect has the right to bring this suit for damages and injunctive relief. A true and
26 correct copy of the '121 patent is attached hereto as Exhibit E.

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28 /////

A. The Leviton Defendants.

124. On information and belief, Defendants Leviton Manufacturing Co., Inc. and EZE Rough System, Inc. (the "Leviton Defendants"), and their agents, are infringing the '121 patent by making, using, offering for sale, and/or selling within the United States devices that embody the inventions disclosed and claimed in the '121 patent, and/or by importing into the United States devices that embody the inventions disclosed and claimed in the '121 patent. On information and belief, at least the following Leviton Defendants' products, alone and/or in combination with other products, directly infringe the claims of the '121 patent: Lev-Lok Modular Receptacle System and/or PowerMount with Lev-Lok products.

125. By way of example and not limitation, the Leviton Defendants' Lev-Lok Modular Receptacle System and/or PowerMount with Lev-Lok products, alone and/or in combination with other products, practice each of the limitations of at least independent claim 1 of the '121 patent. Lev-Lok Modular Receptacle System and/or PowerMount with Lev-Lok products are made, used, sold, offered for sale, and/or imported by the Leviton Defendants in the United States without authorization from ProtectConnect. Therefore, Lev-Lok Modular Receptacle System and/or PowerMount with Lev-Lok products infringe said claim.

126. In addition to direct infringement, ProtectConnect is informed and believes, and on that basis alleges, that the Leviton Defendants have induced and contributed to infringement by others of the '121 patent. By way of example and not limitation, the Leviton Defendants offer to sell and/or sell within the United States to their customers or import into the United States components of patented devices knowing the same to be especially made or especially adapted for use in an infringement of the '121 patent. Such components are not staple articles or commodities of commerce suitable for substantial noninfringing use. On information and belief, the Leviton Defendants also actively induce infringement of the '121 patent by their customers and/or others.

127. Based upon information and belief, the Leviton Defendants have notice of the '121 patent.

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1 128. On information and belief, the Leviton Defendants' infringement of the '121
2 patent has been willful.

3 129. As a result of the Leviton Defendants' acts of infringement, ProtectConnect has
4 suffered and will continue to suffer damages in an amount to be proven at trial.

5 130. ProtectConnect has been irreparably harmed by the Leviton Defendants' acts of
6 infringement, and will continue to be harmed unless and until the Leviton Defendants' acts of
7 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
8 remedy at law and is entitled to a preliminary and permanent injunction against the Leviton
9 Defendants and their infringing products.

10 131. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

11 **B. The Hubbell Defendants.**

12 132. On information and belief, Defendants Hubbell, Inc. (Connecticut) and Hubbell,
13 Inc. (Delaware) (the "Hubbell Defendants"), and their agents, are infringing the '121 patent by
14 making, using, offering for sale, and/or selling within the United States devices that embody the
15 inventions disclosed and claimed in the '121 patent, and/or by importing into the United States
16 devices that embody the inventions disclosed and claimed in the '121 patent. On information and
17 belief, at least the following Hubbell Defendants' products, alone and/or in combination with
18 other products, directly infringe the claims of the '121 patent: SNAPConnect.

19 133. By way of example and not limitation, the Hubbell Defendants' SNAPConnect
20 products, alone and/or in combination with other products, practice each of the limitations of at
21 least independent claim 1 of the '121 patent. SNAPConnect products are made, used, sold,
22 offered for sale, and/or imported by the Hubbell Defendants in the United States without
23 authorization from ProtectConnect. Therefore, SNAPConnect products infringe at least said
24 claim.

25 134. In addition to direct infringement, ProtectConnect is informed and believes, and
26 on that basis alleges, that the Hubbell Defendants have induced and contributed to infringement
27 by others of the '121 patent. By way of example and not limitation, the Hubbell Defendants offer
28 to sell and/or sell within the United States to its customers or import into the United States

1 components of patented devices knowing the same to be especially made or especially adapted
2 for use in an infringement of the '121 patent. Such components are not staple articles or
3 commodities of commerce suitable for substantial noninfringing use. On information and belief,
4 the Hubbell Defendants also actively induce infringement of the '121 patent by their customers
5 and/or others.

6 135. Based upon information and belief, the Hubbell Defendants have notice of the
7 '121 patent.

8 136. On information and belief, the Hubbell Defendants' infringement of the '121
9 patent has been willful.

10 137. As a result of the Hubbell Defendants' acts of infringement, ProtectConnect has
11 suffered and will continue to suffer damages in an amount to be proven at trial.

12 138. ProtectConnect has been irreparably harmed by the Hubbell Defendants' acts of
13 infringement, and will continue to be harmed unless and until the Hubbell Defendants' acts of
14 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
15 remedy at law and is entitled to a preliminary and permanent injunction against the Hubbell
16 Defendants and their infringing products.

17 139. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

18 **C. The Cooper Defendants.**

19 140. On information and belief, Defendants Cooper Wiring Devices, Inc. and Cooper
20 B-Line, Inc. (collectively, the "Cooper Defendants"), and their agents, are each infringing the
21 '121 patent by making, using, offering for sale, and/or selling within the United States devices
22 that embody the inventions disclosed and claimed in the '121 patent, and/or by importing into the
23 United States devices that embody the inventions disclosed and claimed in the '121 patent. On
24 information and belief, at least the following Cooper Defendants' products, alone and/or in
25 combination with other products, directly infringe the claims of the '121 patent: Arrowlink
26 Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with Arrowlink.

27 141. By way of example and not limitation, the Cooper Defendants' Arrowlink
28 Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with Arrowlink, alone and/or in

1 combination with other products, practice each of the limitations of at least independent claim 1
2 of the '121 patent. Arrowlink Modular Wiring Devices and/or Ruff-In Pre-Fab Systems with
3 Arrowlink are made, used, sold, offered for sale, and/or imported by the Cooper Defendants in the
4 United States without authorization from ProtectConnect. Therefore, Arrowlink Modular Wiring
5 Devices and/or Ruff-In Pre-Fab Systems with Arrowlink infringe at least said claim.

6 142. In addition to direct infringement, ProtectConnect is informed and believes, and
7 on that basis alleges, that the Cooper Defendants have induced and contributed to infringement by
8 others of the '121 patent. By way of example and not limitation, the Cooper Defendants offer to
9 sell and/or sell within the United States to their customers or import into the United States
10 components of patented devices knowing the same to be especially made or especially adapted
11 for use in an infringement of the '121 patent. Such components are not staple articles or
12 commodities of commerce suitable for substantial noninfringing use. On information and belief,
13 the Cooper Defendants also actively induce infringement of the '121 patent by their customers
14 and/or other downstream users of its Arrowlink Modular Wiring Devices and/or Ruff-In Pre-Fab
15 Systems with Arrowlink products.

16 143. Based upon information and belief, the Cooper Defendants have notice of the '121
17 patent.

18 144. On information and belief, the Cooper Defendants' infringement of the '121 patent
19 has been willful.

20 145. As a result of the Cooper Defendants' acts of infringement, ProtectConnect has
21 suffered and will continue to suffer damages in an amount to be proven at trial.

22 146. ProtectConnect has been irreparably harmed by the Cooper Defendants' acts of
23 infringement, and will continue to be harmed unless and until the Cooper Defendants' acts of
24 infringement are enjoined and restrained by order of this Court. ProtectConnect has no adequate
25 remedy at law and is entitled to a preliminary and permanent injunction against the Cooper
26 Defendants and their infringing products.

27 147. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285.

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D. The Pass& Seymour Defendants.

148. On information and belief, Defendants Pass & Seymour, Inc. and Cablofil, Inc. (the "Pass & Seymour Defendants"), and their agents, are infringing the '121 patent by making, using, offering for sale, and/or selling within the United States devices that embody the inventions disclosed and claimed in the '121 patent, and/or by importing into the United States devices that embody the inventions disclosed and claimed in the '121 patent. On information and belief, at least the following Pass & Seymour Defendants' products, alone and/or in combination with other products, directly infringe the claims of the '121 patent: PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems, and/or FAS Power Pre-fabricated Wiring Assemblies.

149. By way of example and not limitation, Pass & Seymour Defendants' PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems, and/or FAS Power Pre-fabricated Wiring Assemblies, alone and/or in combination with other products, practice each of the limitations of at least independent claim 1 of the '121 patent. PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems and/or FAS Power Pre-fabricated Wiring Assemblies are made, used, sold, offered for sale, and/or imported by the Pass & Seymour Defendants in the United States without authorization from ProtectConnect. Therefore, PlugTail Wiring Devices, PlugTail Power Pre-Fabricated Wiring Assemblies and Systems and/or FAS Power Pre-fabricated Wiring Assemblies infringe said claim.

150. In addition to direct infringement, ProtectConnect is informed and believes, and on that basis alleges, that the Pass & Seymour Defendants have induced and contributed to infringement by others of the '121 patent. By way of example and not limitation, the Pass & Seymour Defendants offer to sell and/or sell within the United States to their customers or import into the United States components of patented devices knowing the same to be especially made or especially adapted for use in an infringement of the '121 patent. Such components are not staple articles or commodities of commerce suitable for substantial noninfringing use. On information

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1 and belief, the Pass & Seymour Defendants also actively induce infringement of the '121 patent
2 by their customers and/or others.

3 151. Based upon information and belief, the Pass & Seymour Defendants have notice of
4 the '121 patent.

5 152. On information and belief, the Pass & Seymour Defendants' infringement of the
6 '121 patent has been willful.

7 153. As a result of the Pass & Seymour Defendants' acts of infringement,
8 ProtectConnect has suffered and will continue to suffer damages in an amount to be proven at
9 trial.

10 154. ProtectConnect has been irreparably harmed by the Pass & Seymour Defendants'
11 acts of infringement, and will continue to be harmed unless and until the Pass & Seymour
12 Defendants' acts of infringement are enjoined and restrained by order of this Court.
13 ProtectConnect has no adequate remedy at law and is entitled to a preliminary and permanent
14 injunction against the Pass & Seymour Defendants and their infringing products.

15 155. This case is an "exceptional" case within the meaning of 35 U.S.C. § 285 and
16 ProtectConnect is entitled to an award of attorneys' fees.

17 **PRAYER FOR RELIEF**

18 WHEREFORE: ProtectConnect prays for judgment against each Defendant as follows:

19 1. A judgment that each Defendant has infringed, induced others to infringe, and/or
20 committed acts of contributory infringement with respect to the claims of the patents in suit;

21 2. A judgment that each Defendant's infringement of each of the patents in suit has
22 been deliberate and willful;

23 3. An order preliminarily and permanently enjoining each Defendant and its
24 subsidiaries, affiliates, officers, agents, servants, employees, licensees and all other persons acting
25 or attempting to act in active concert or participation with it or acting on its behalf, from further
26 infringement, inducement of infringement, or contributory infringement of each of the patents in
27 suit;

28 /////

1 4. An order directing each Defendant to account for and pay to ProtectConnect all
2 damages caused to ProtectConnect by reason of Defendants' patent infringement, pursuant to 35
3 U.S.C. § 284, including increased damages under 35 U.S.C. § 284;

4 5. An award of pre-judgment and post-judgment interest on the damages caused to
5 ProtectConnect by each Defendant;

6 6. A finding that this is an "exceptional" case and an order directing each Defendant
7 to pay ProtectConnect's costs, expenses and reasonable attorneys' fees pursuant to 35 U.S.C. §
8 285; and

9 7. Any other legal and/or equitable relief as the Court deems just and proper.

10 **DEMAND FOR JURY TRIAL**

11 ProtectConnect demands a trial by jury for all issues so triable pursuant to Federal Rule of
12 Civil Procedure 38(b).

13 Dated: April 12, 2010

14 DLA PIPER LLP (US)

15 By 

16 John Allcock (Bar No. 098895)
17 Rick Mulloy (Bar No. 199278)
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25 Attorneys for Plaintiff
26 ProtectConnect, Inc.

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EXHIBITS

<u>Exhibit</u>	<u>Description</u>	<u>Pages</u>
A	A copy of United States Patent No. 6,341,981	32 - 93
B	A copy of United States Patent No. 7,052,313	94 - 147
C	A copy of United States Patent Application Publication No. US 2005/0272304	148 - 202
D	A copy of United States Patent No. 7,265,291	203 - 256
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US006341981B1

(12) **United States Patent**
Gorman

(10) **Patent No.:** US 6,341,981 B1
(45) **Date of Patent:** Jan. 29, 2002

(54) **SAFETY ELECTRICAL OUTLET AND SWITCH SYSTEM**

(76) **Inventor:** Michael P. Gorman, 18 St. Vincent, Laguna Nigel, CA (US) 92677

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) **Appl. No.:** 09/553,425

(22) **Filed:** Apr. 19, 2000

Related U.S. Application Data

(60) Provisional application No. 60/174,521, filed on Jan. 5, 2000.

(51) **Int. Cl.⁷** H01R 13/60

(52) **U.S. Cl.** 439/535; 174/53; 174/57; 200/51 R

(58) **Field of Search** 139/535; 174/53, 174/57, 60; 220/3.9, 3.6; 200/51 R

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Primary Examiner—Gary Paumen

Assistant Examiner—Alexander Gilman

(74) *Attorney, Agent, or Firm*—Glenn R. Smith

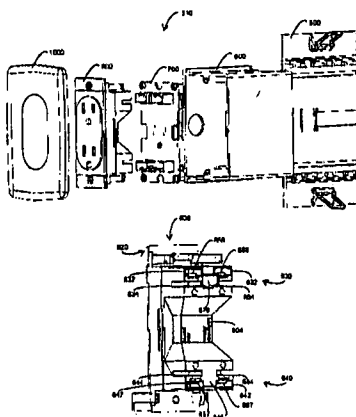
(57) **ABSTRACT**

An electrical outlet and switch system allows snap-in installation and snap-out removal of outlet and switch modules without exposure to high-voltage conductors. The system includes an electrical box, a wiring panel, an outlet or switch module and a corresponding face plate. The wiring panel back side has attachment points for a power cable to be routed through a back portion of the electrical box. The wiring panel front side has a fixture configured to accept an outlet or switch module. The wiring panel physically isolates, yet electrically connects the attached power cable and the module. Module contacts provide electrical connection to the panel contacts. The panel fixture has protective structures that prevent inadvertent exposure to and short circuiting of the panel contacts.

The electrical box is configured for internal placement of the wiring panel, allowing electrical box wiring and verification and electrical system activation prior to wall panel construction. The installed wiring panel has a socket configured to accept a standard AC plug, providing a convenient electrical source prior to outlet module installation. The system also includes a shield configured to fit inside the electrical box and to conform to the wiring panel front side, protecting the electrical box and the installed wiring panel during the makeup phase of construction. After wall panels are installed, the modules can be snapped into the electrical box without the aid of a journeyman electrician. Should a module be damaged at a later date, a homeowner or layman can easily remove and replace the damaged module.

The electrical box has an associated box mount providing installation to studs during rough framing of a residential or commercial building. The box mount has a stud alignment guide for accurate placement of the electrical box on a wall stud. In conjunction with this stud alignment feature, the electrical box slides relative to the box mount and is removably locked in one of several fixed positions in order to locate the electrical box front face flush with the exterior surface of wall panels having various thicknesses.

35 Claims, 46 Drawing Sheets



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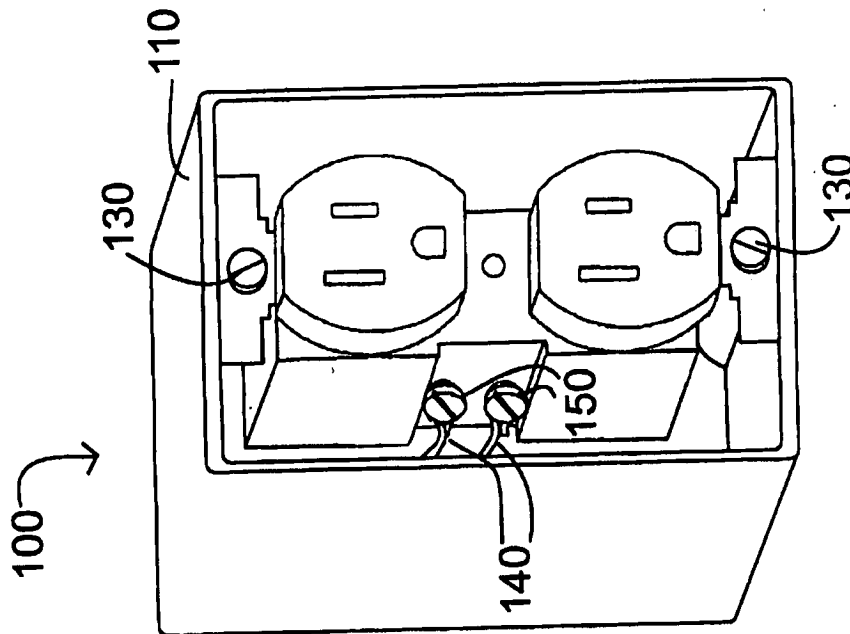


FIG. 1 (Prior Art)

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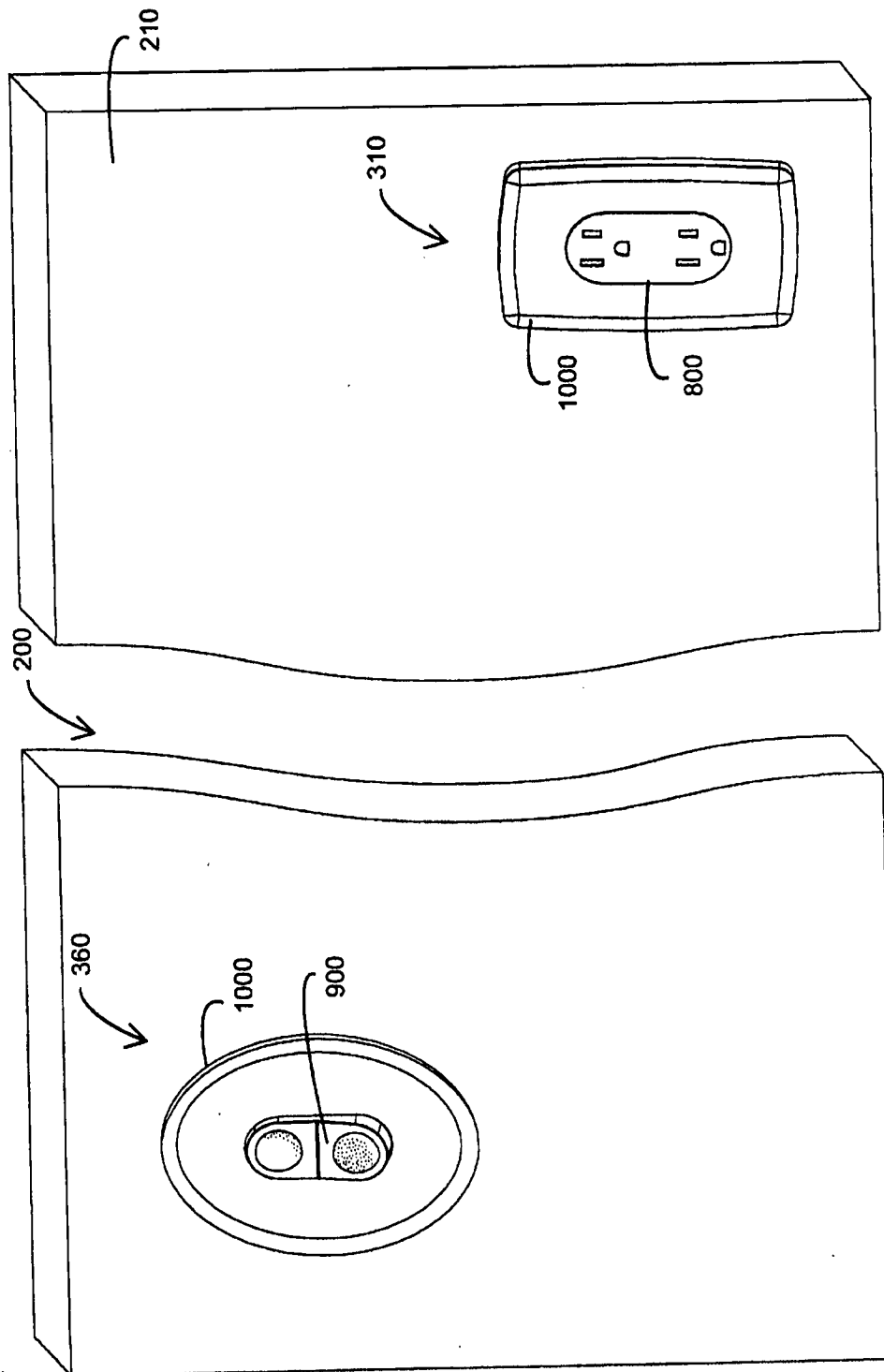


FIG. 2

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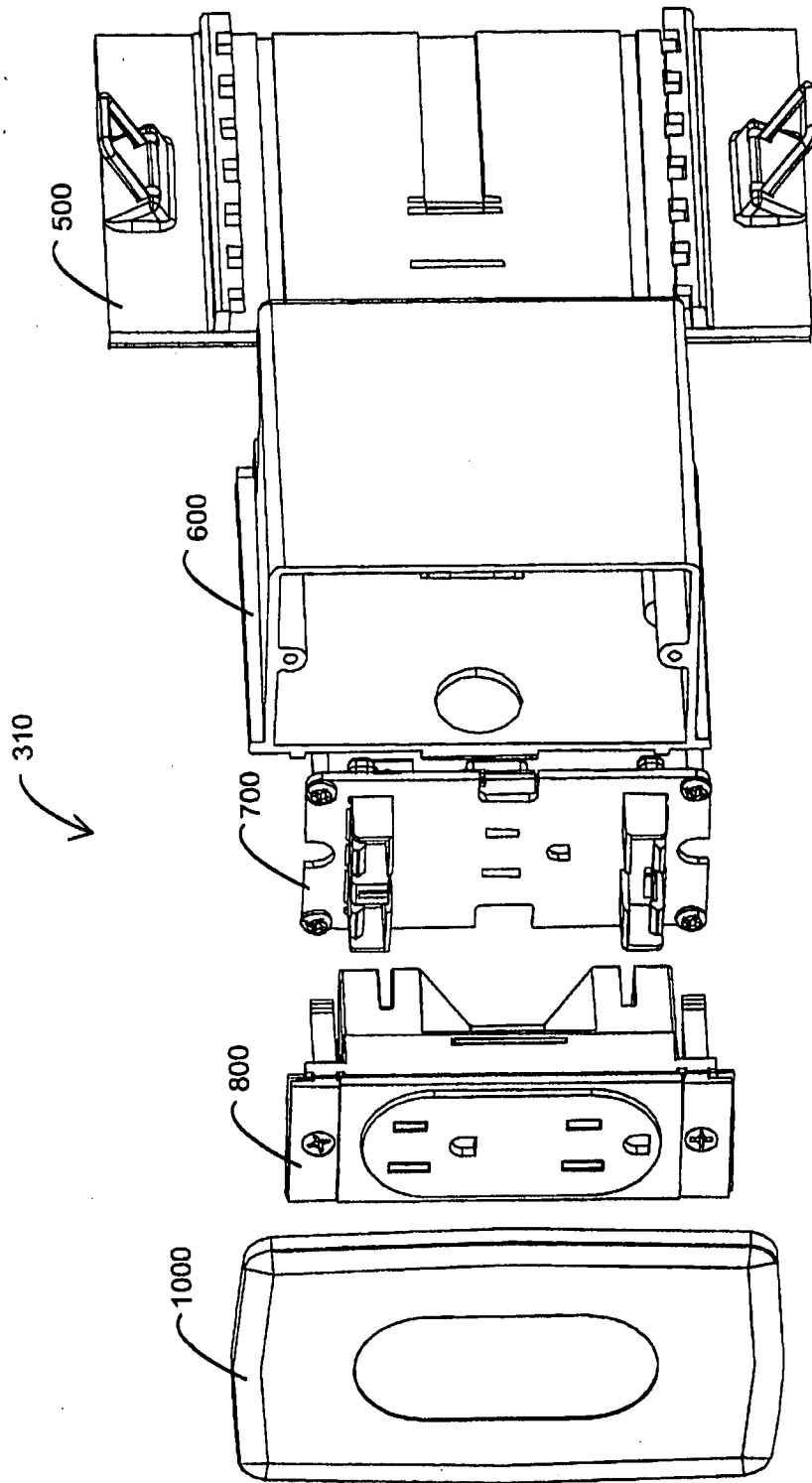


FIG. 3A

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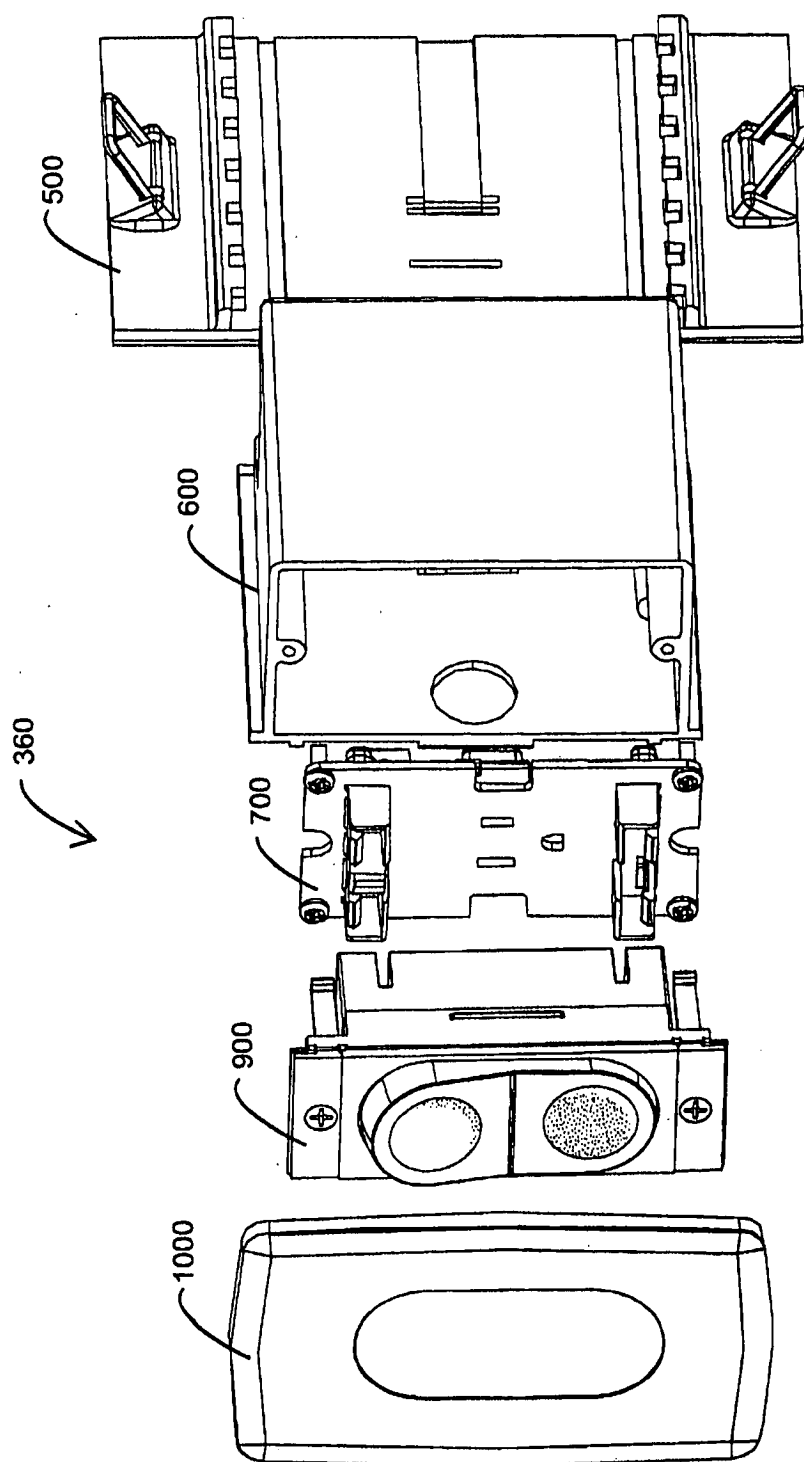


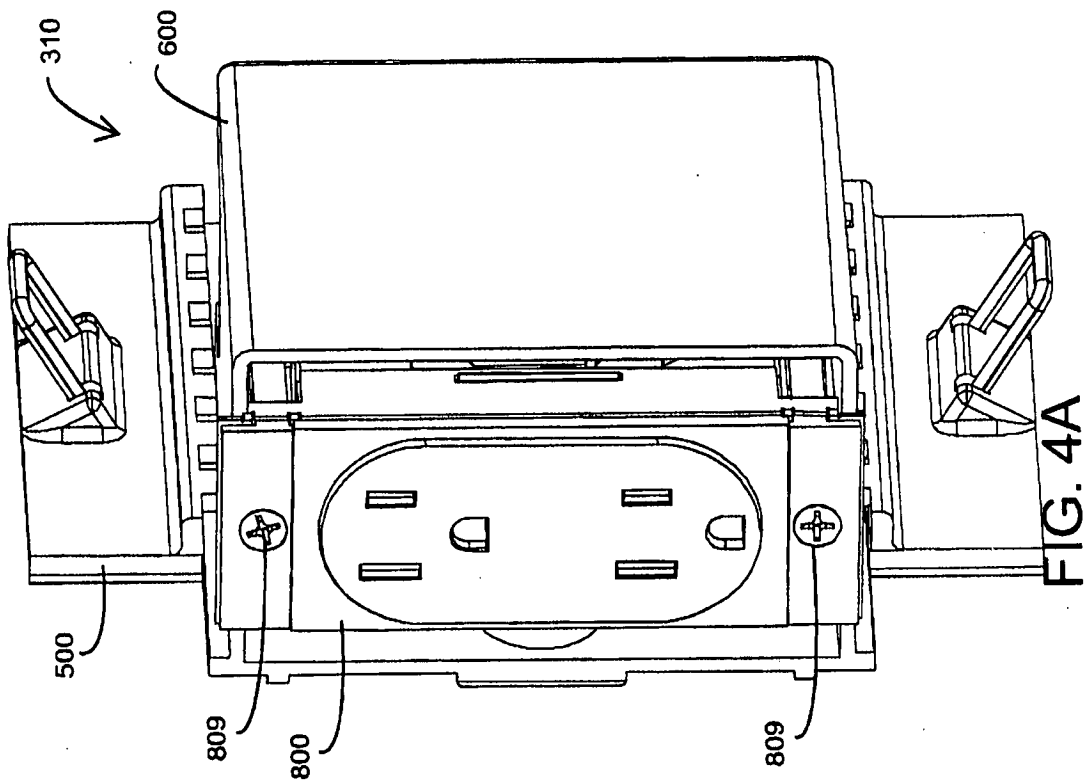
FIG. 3B

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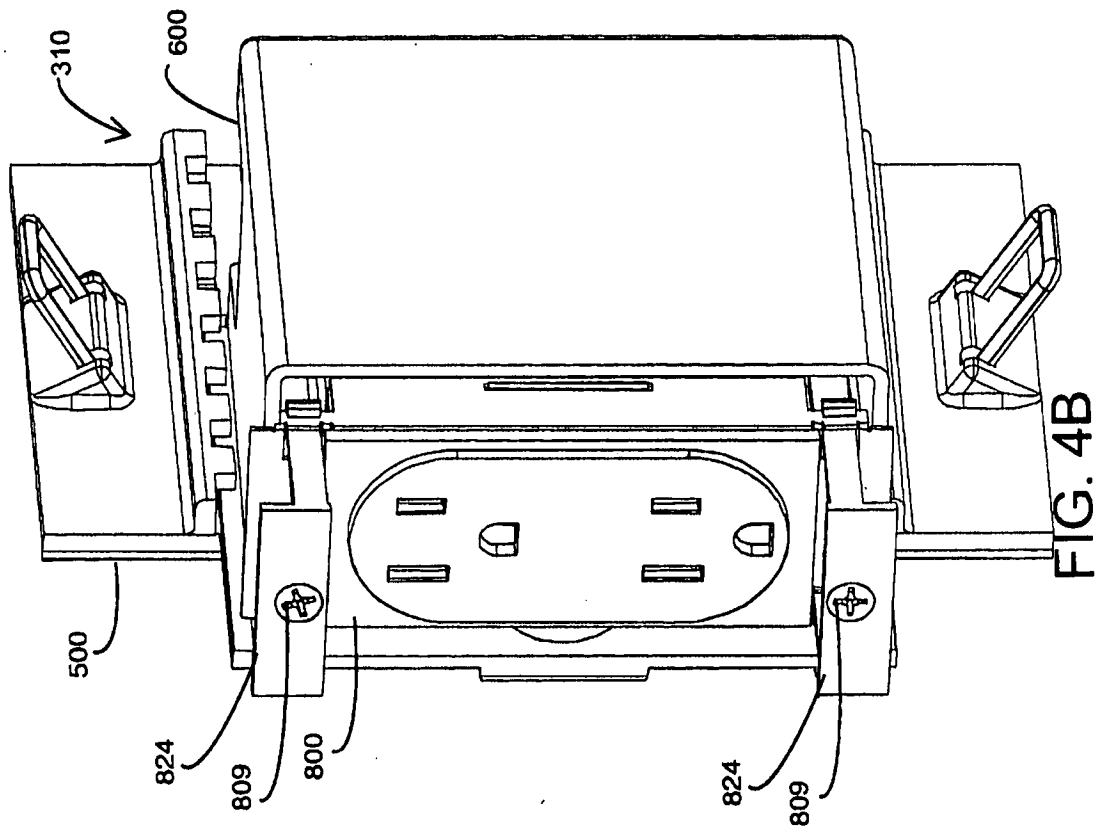


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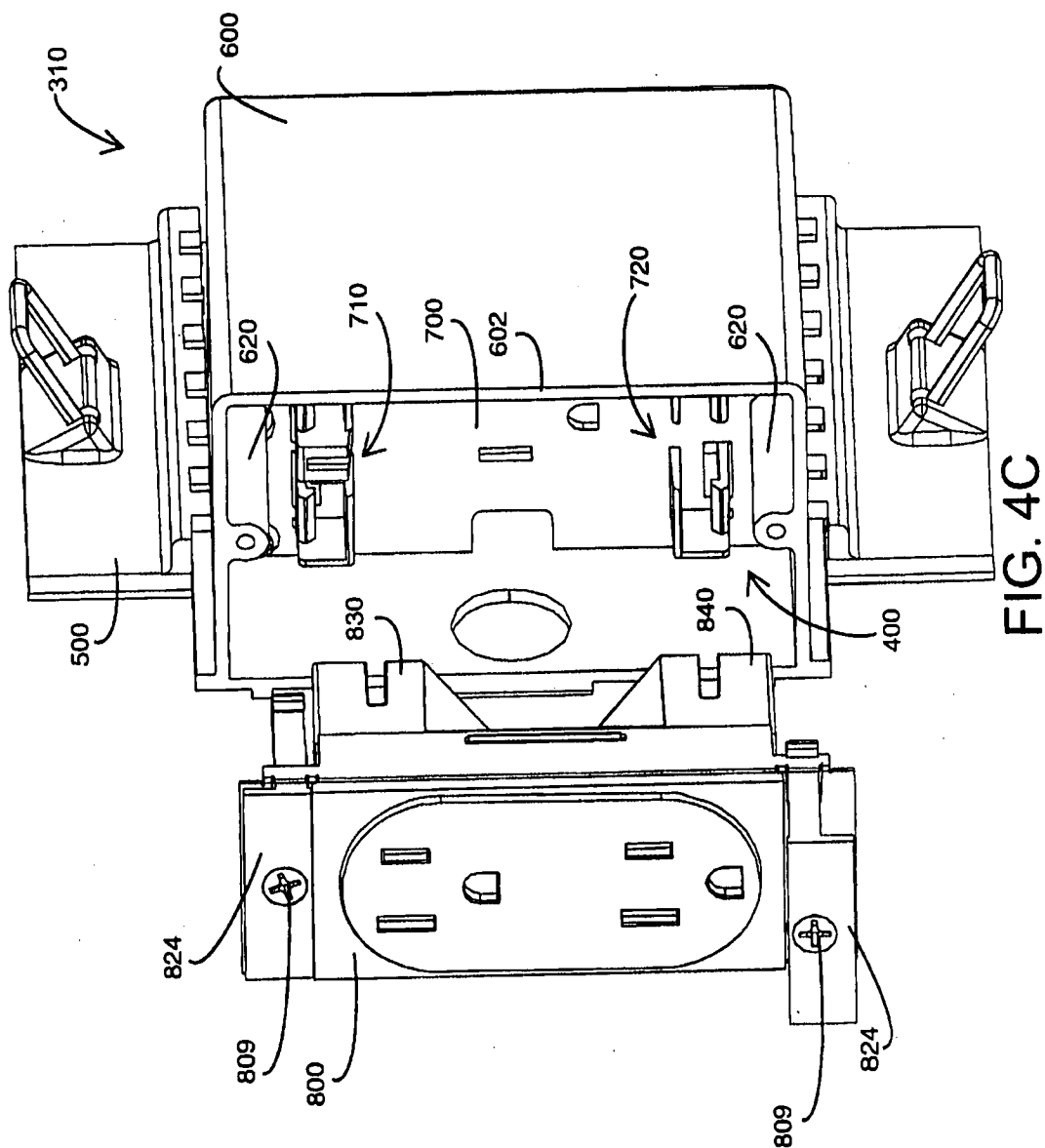


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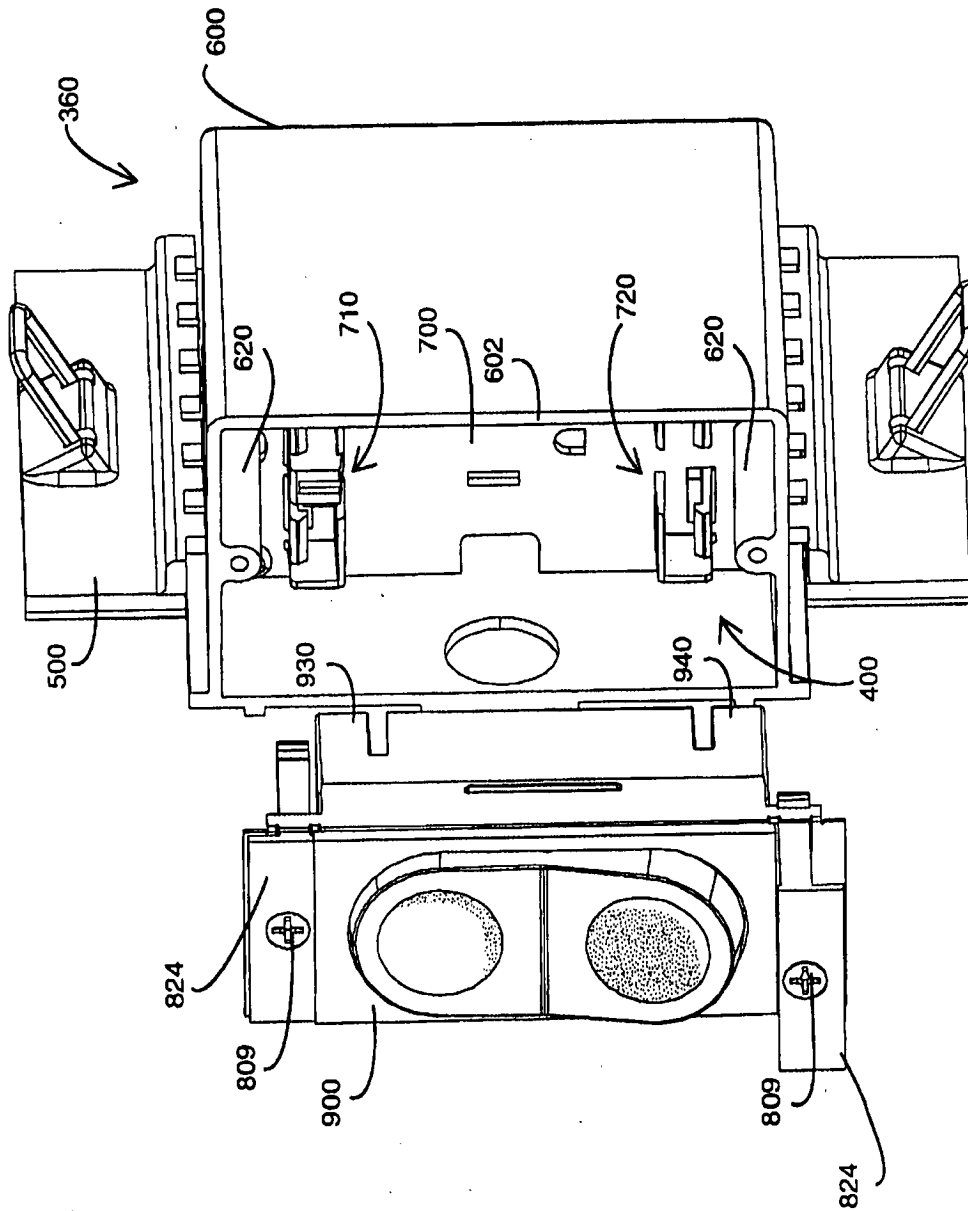


FIG. 4D

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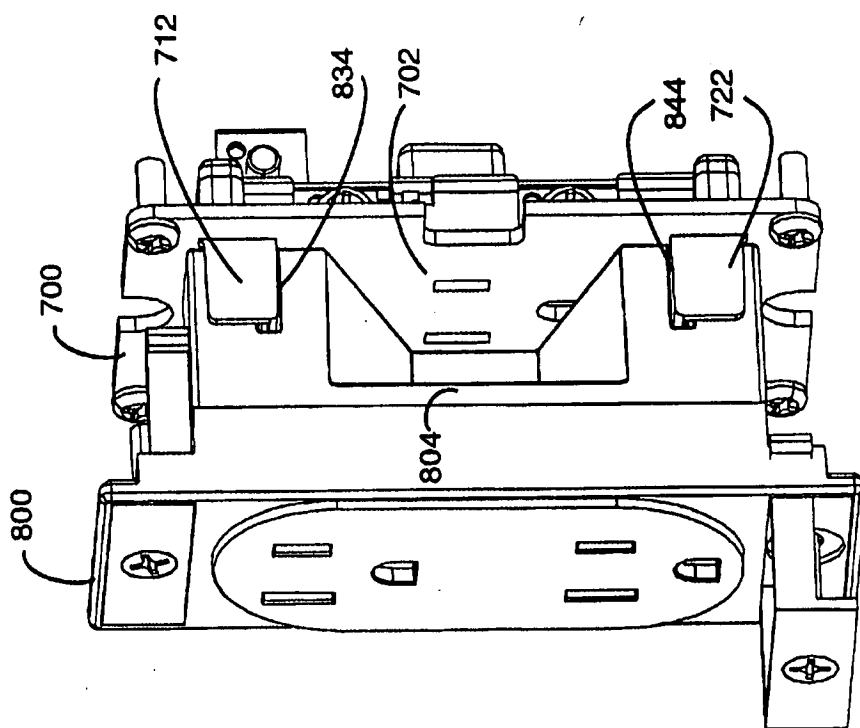


FIG. 4E

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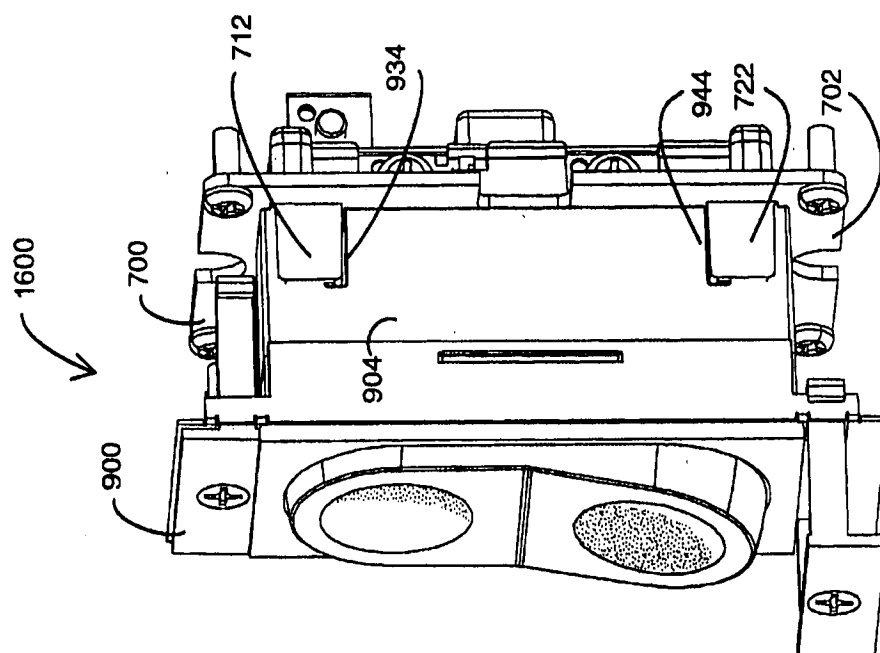


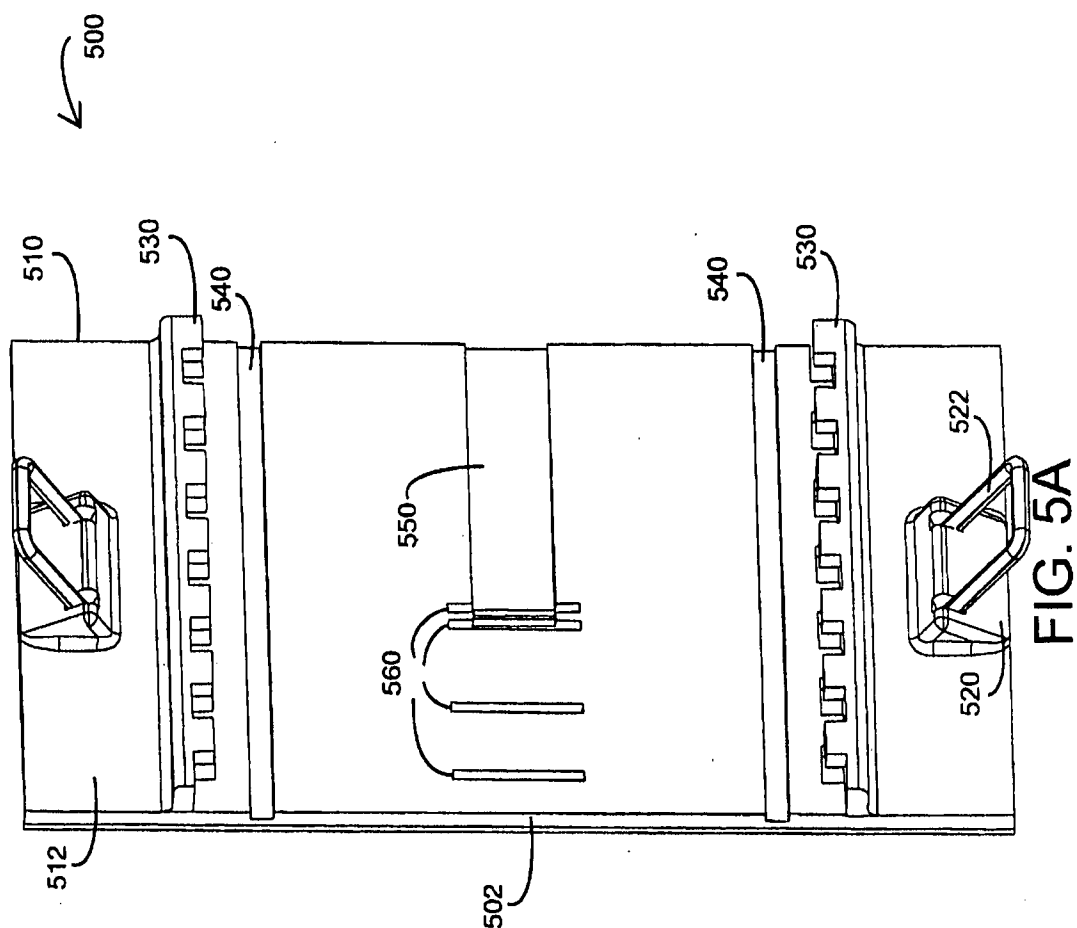
FIG. 4F

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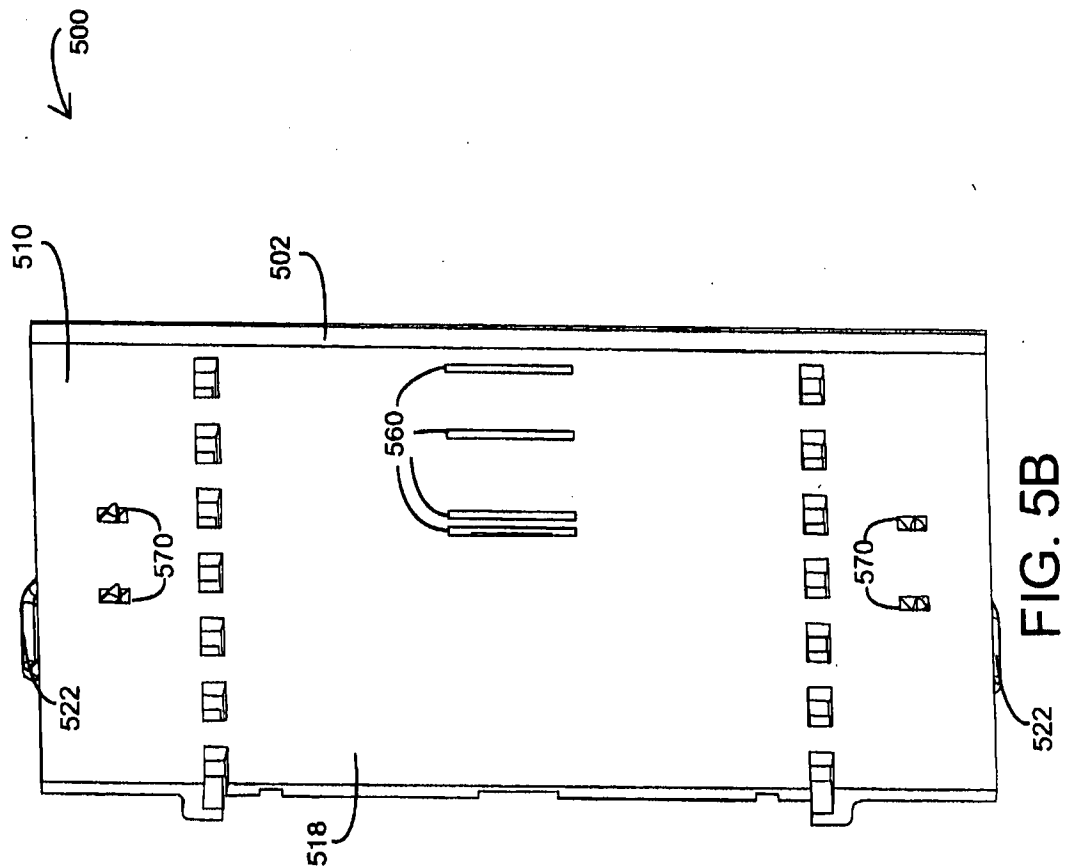


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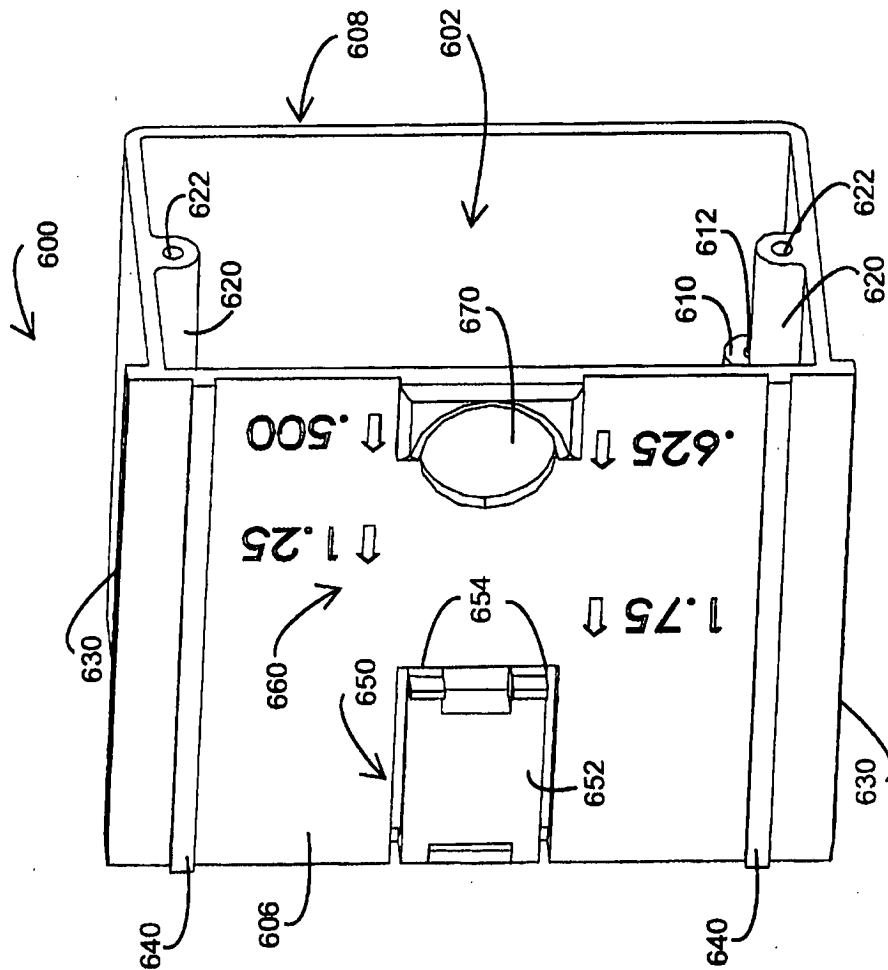


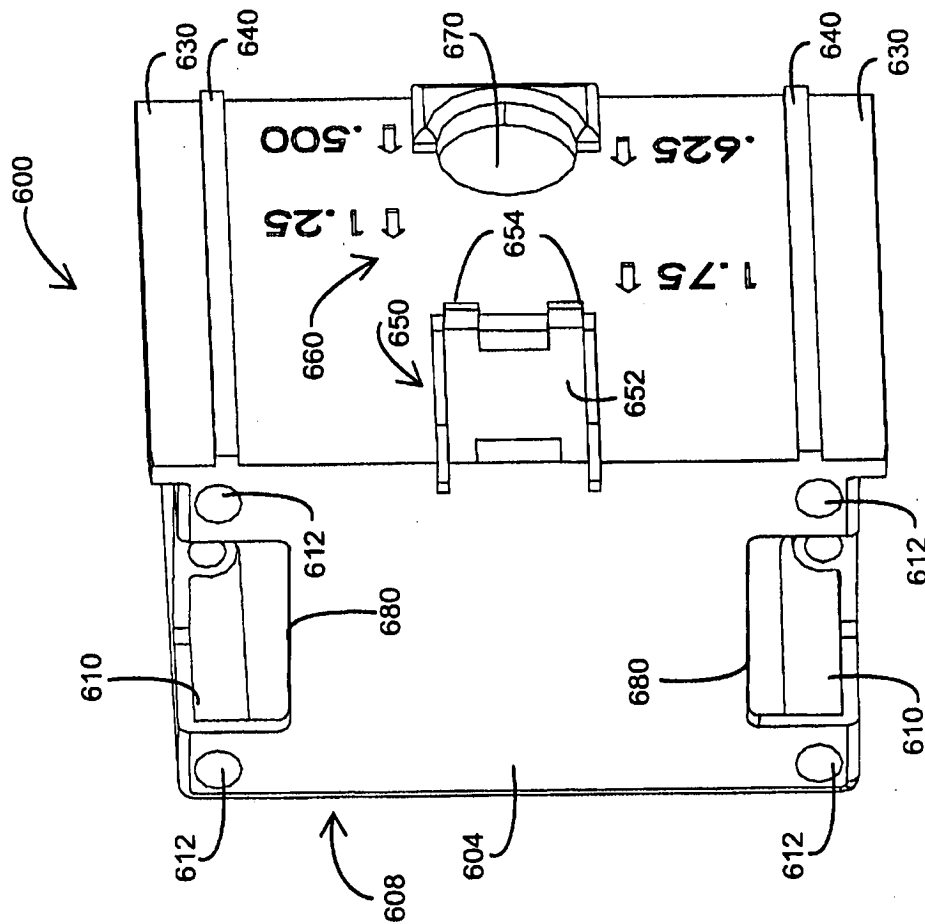
FIG. 6A

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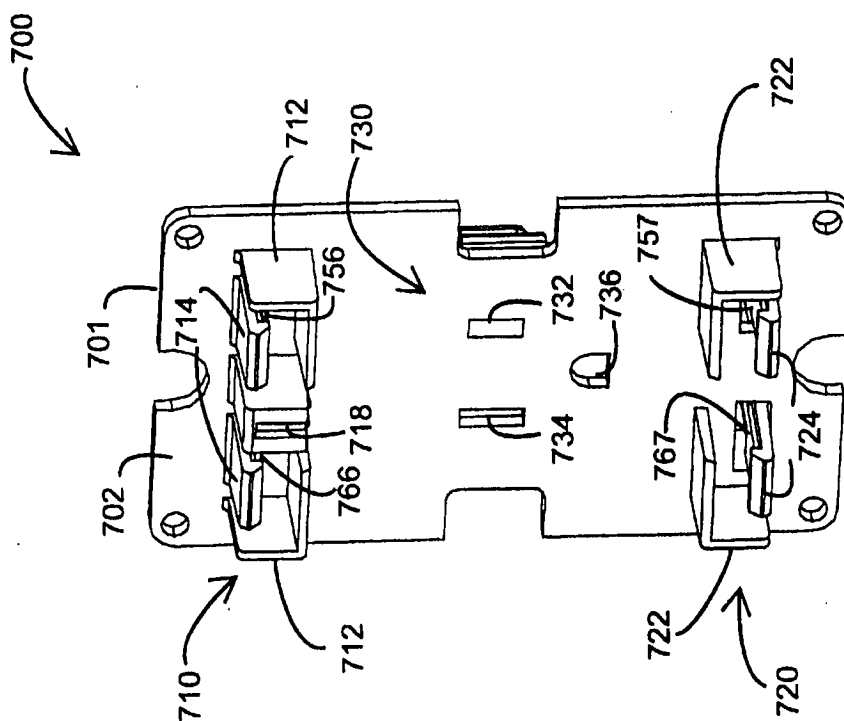


FIG. 7A

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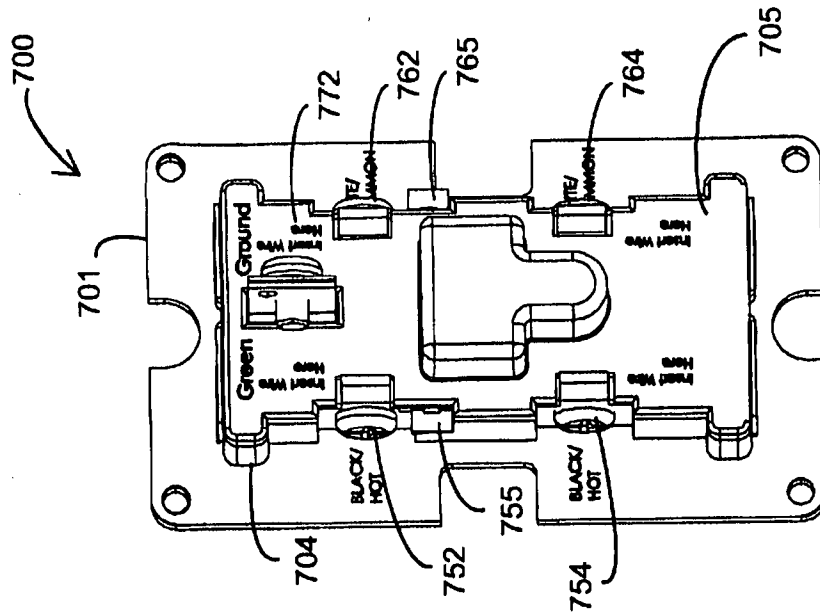


FIG. 7B

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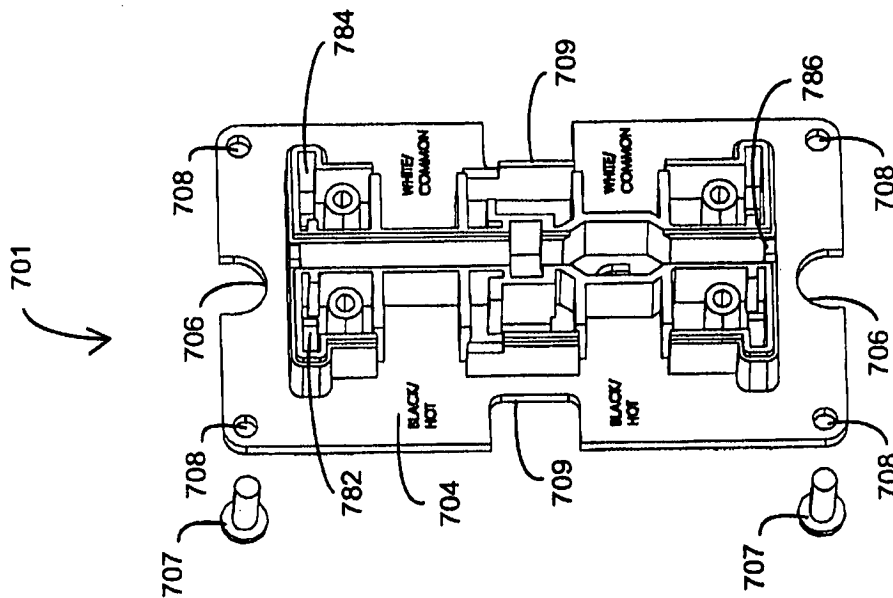


FIG. 7C

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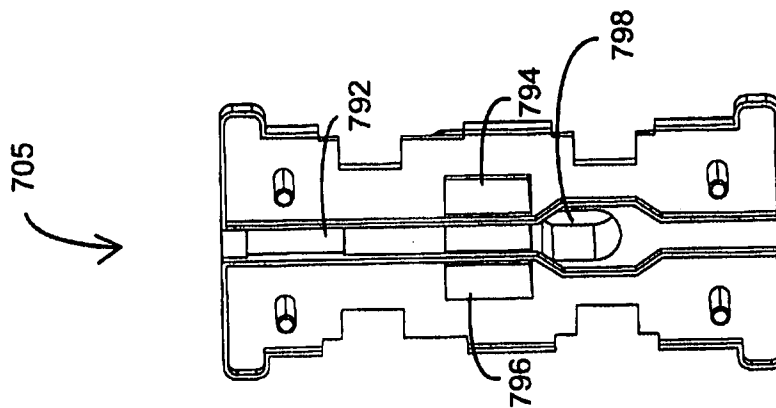


FIG. 7D

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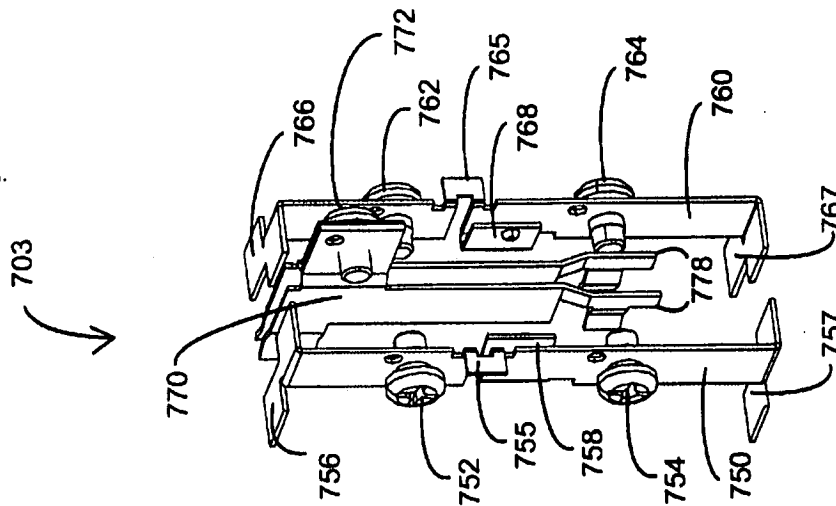


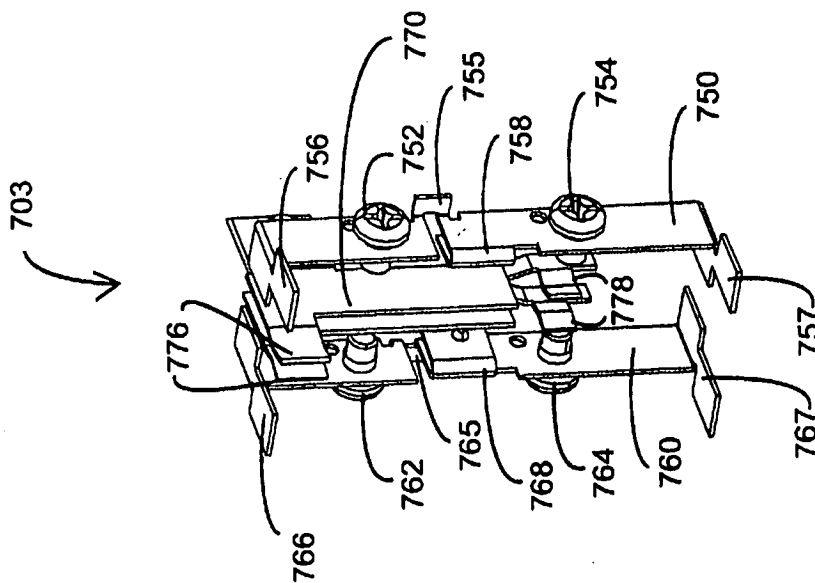
FIG. 7E

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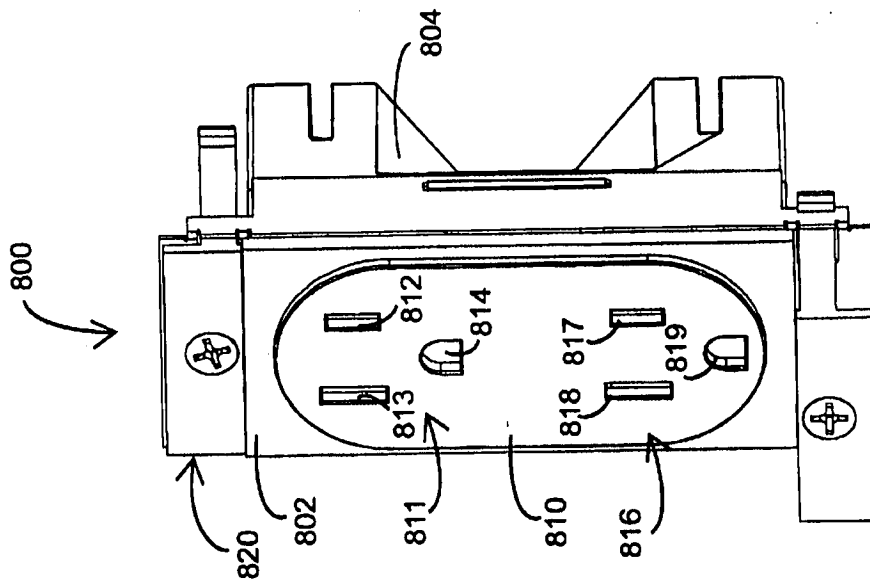


FIG. 8A

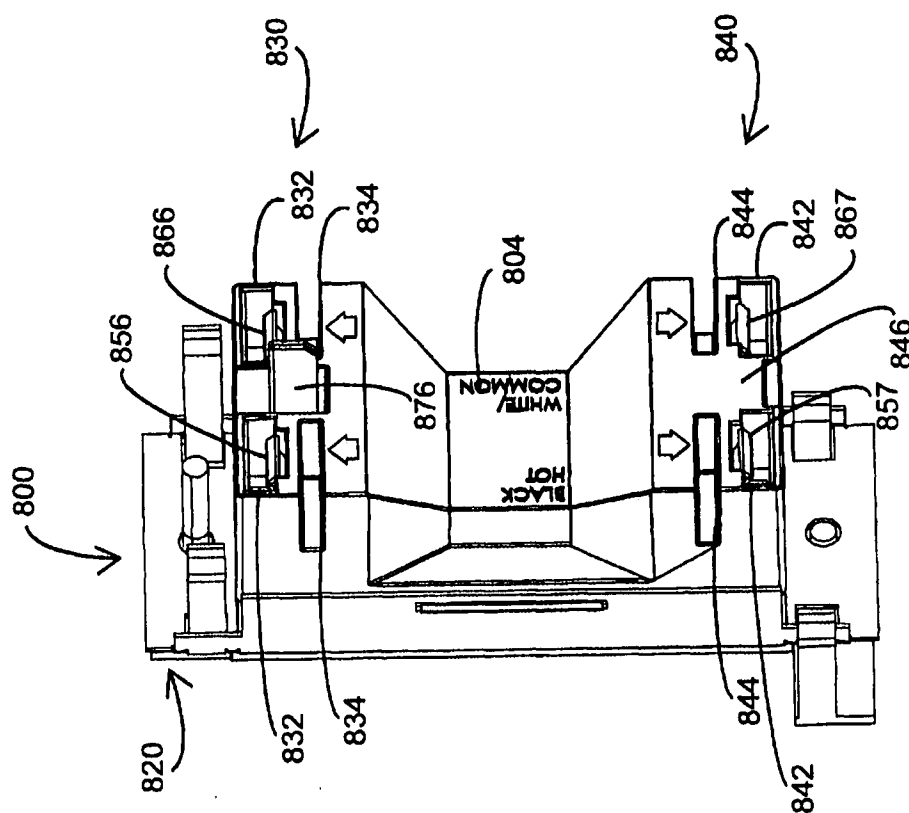


FIG. 8B

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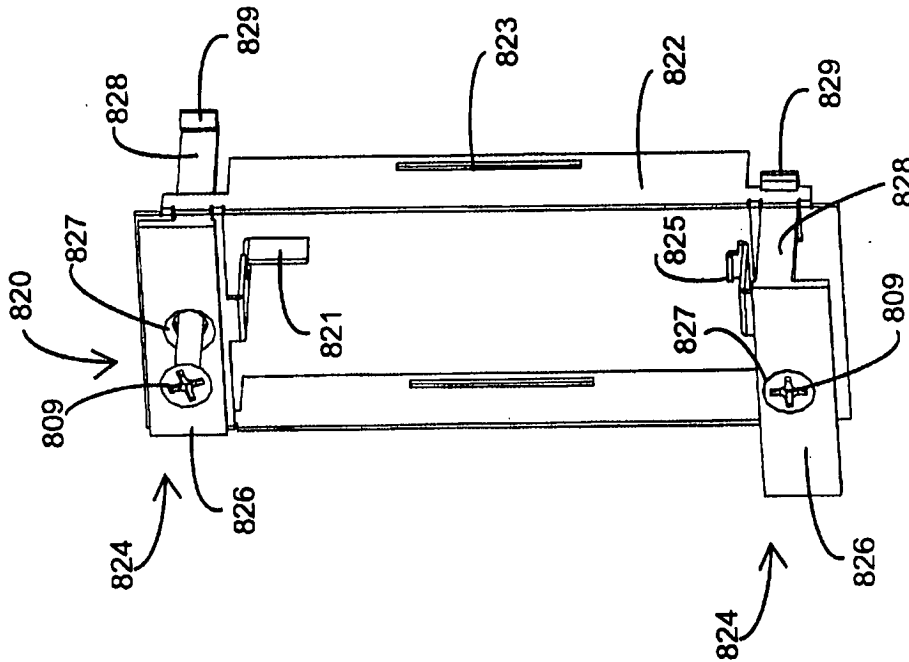


FIG. 8C

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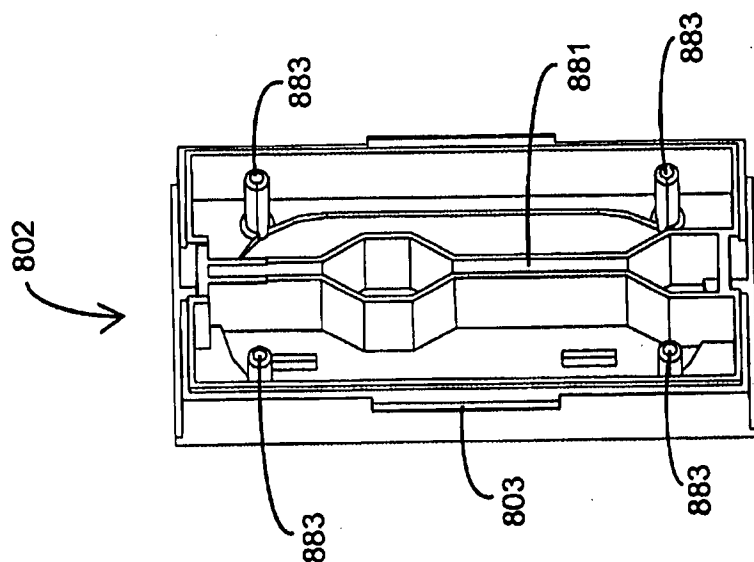


FIG. 8D

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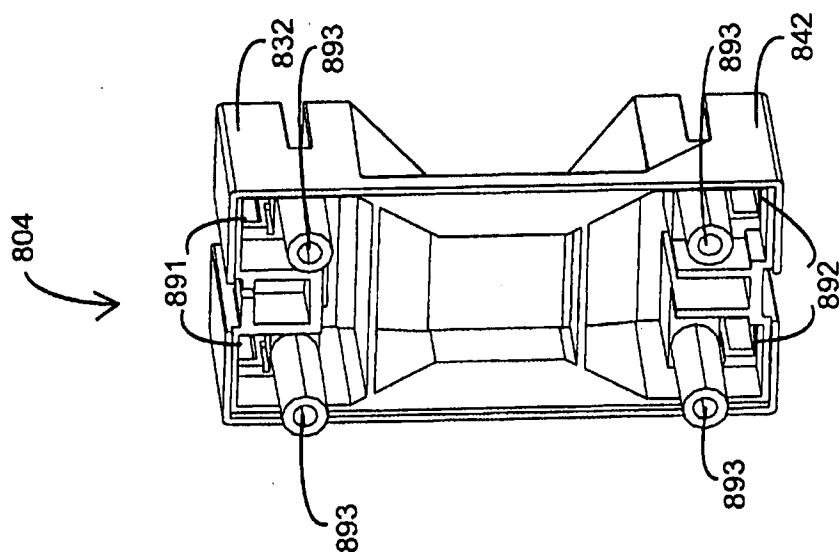


FIG. 8E

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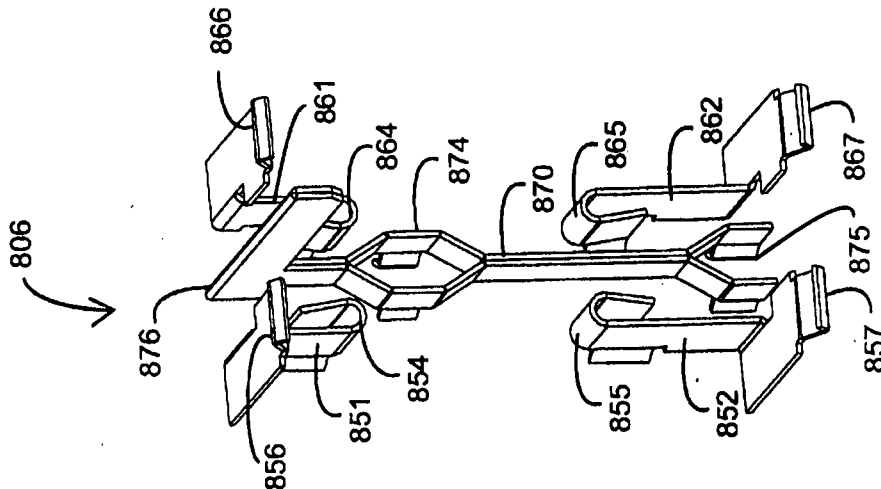


FIG. 8F

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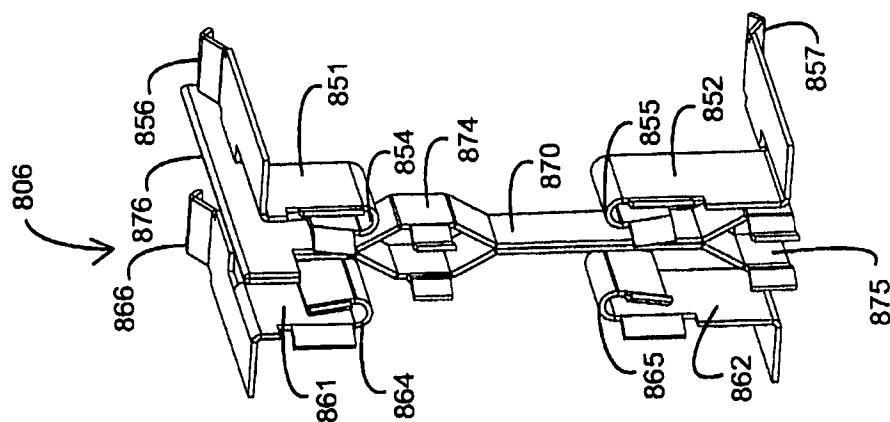


FIG. 8G

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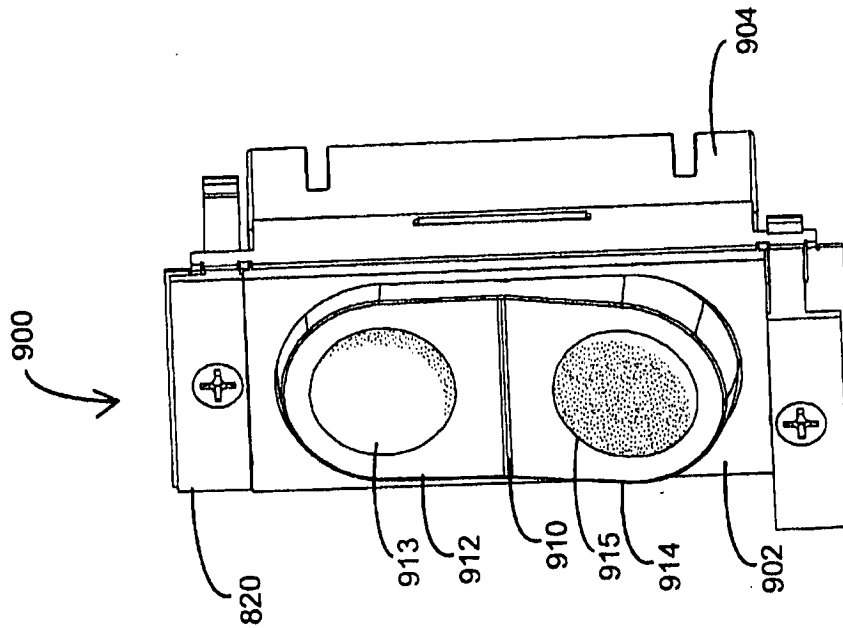


FIG. 9A

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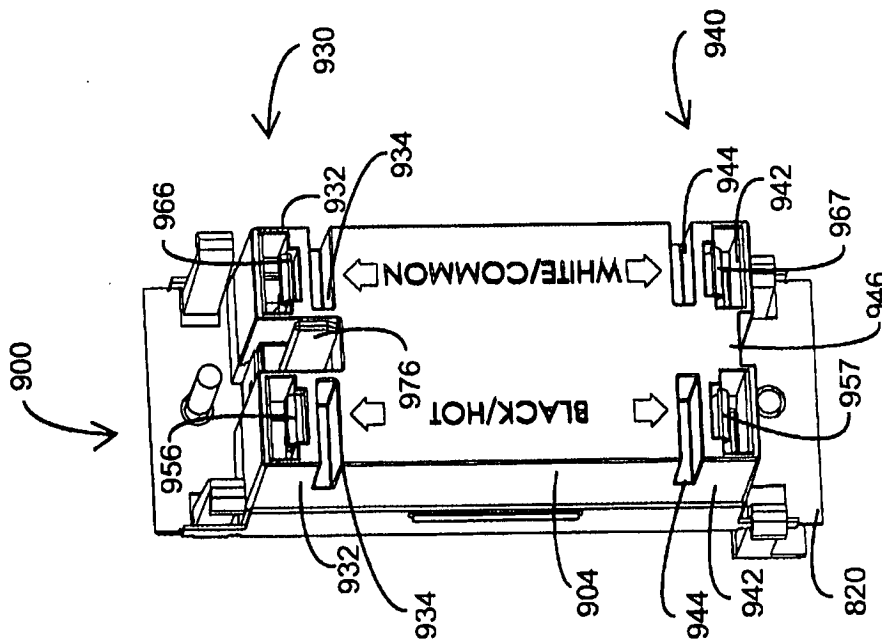


FIG. 9B

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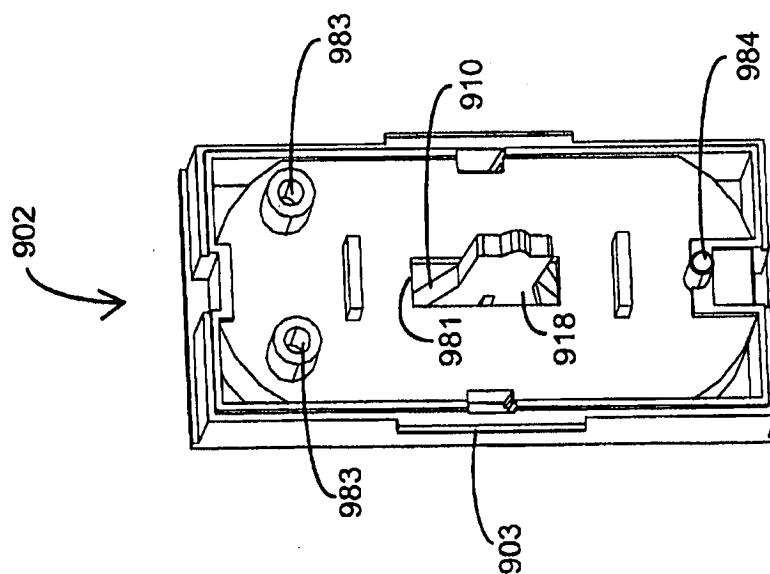


FIG. 9C

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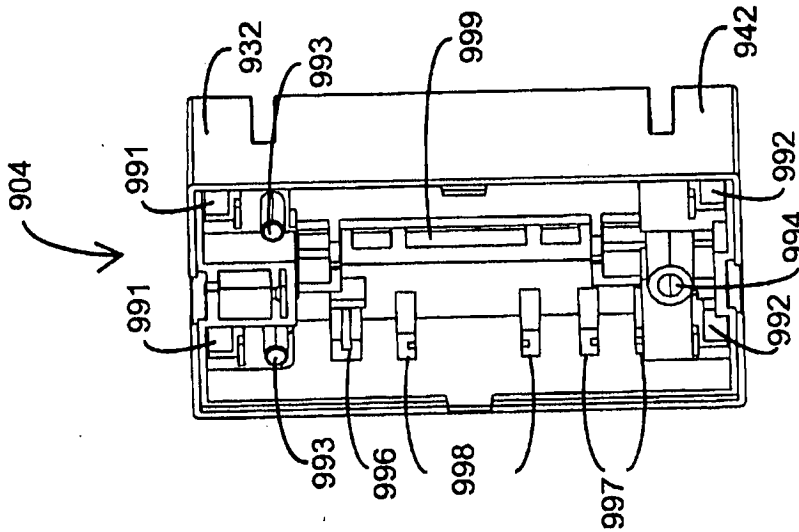


FIG. 9D

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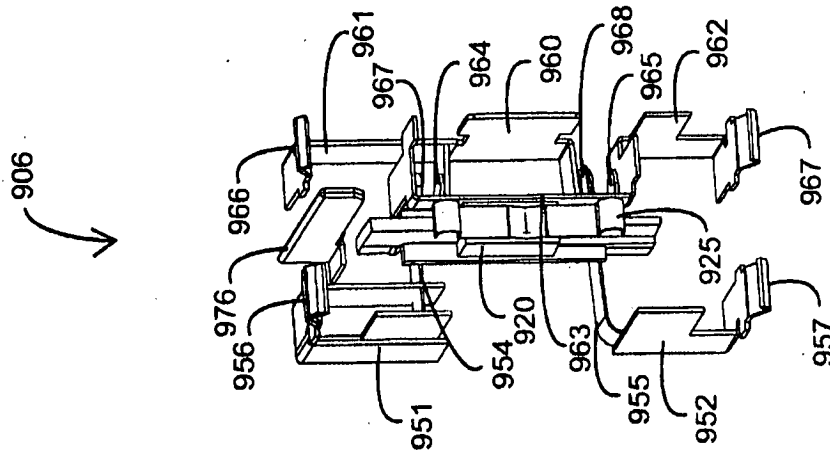


FIG. 9E

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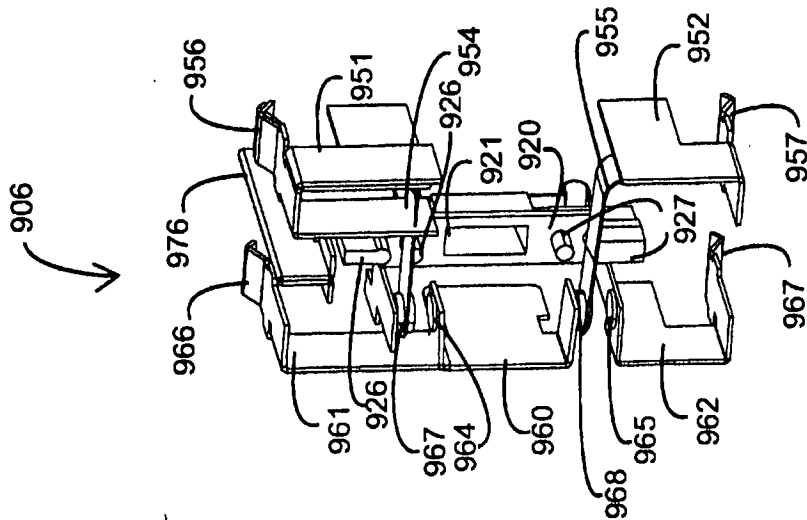


FIG. 9F

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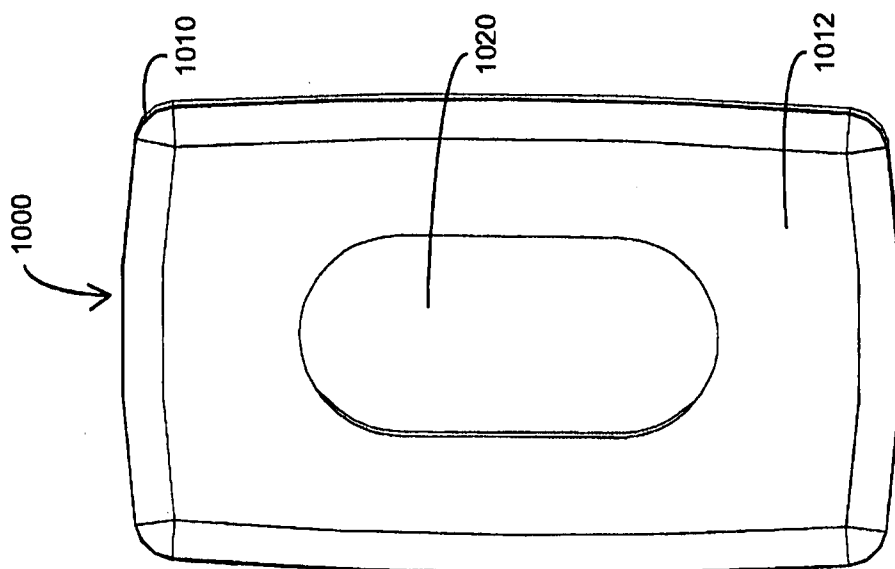


FIG. 10A

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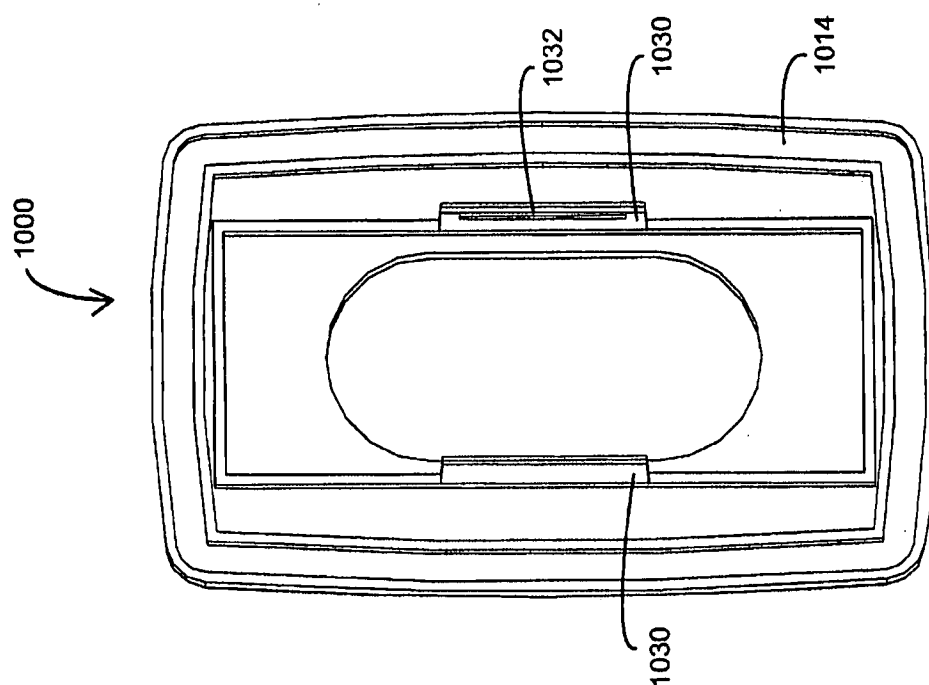


FIG. 10B

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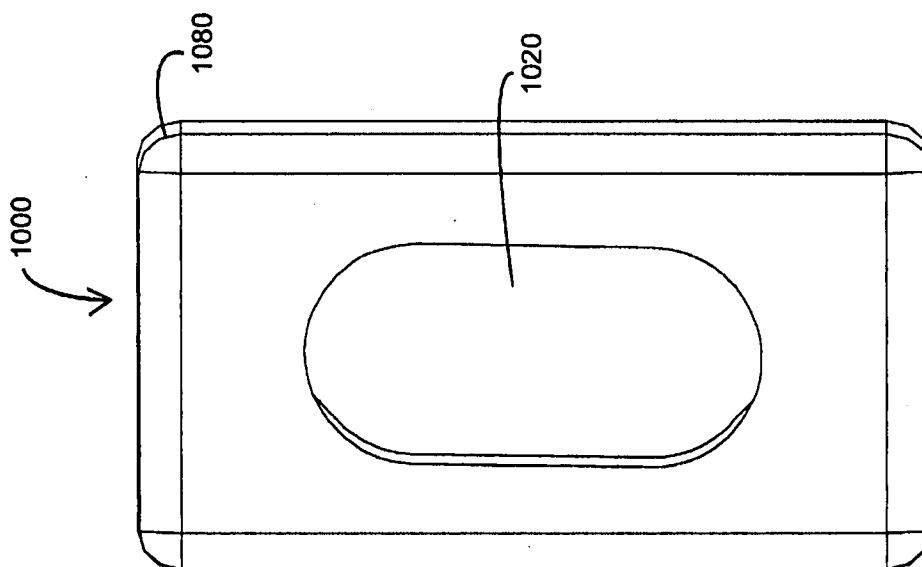


FIG. 10C

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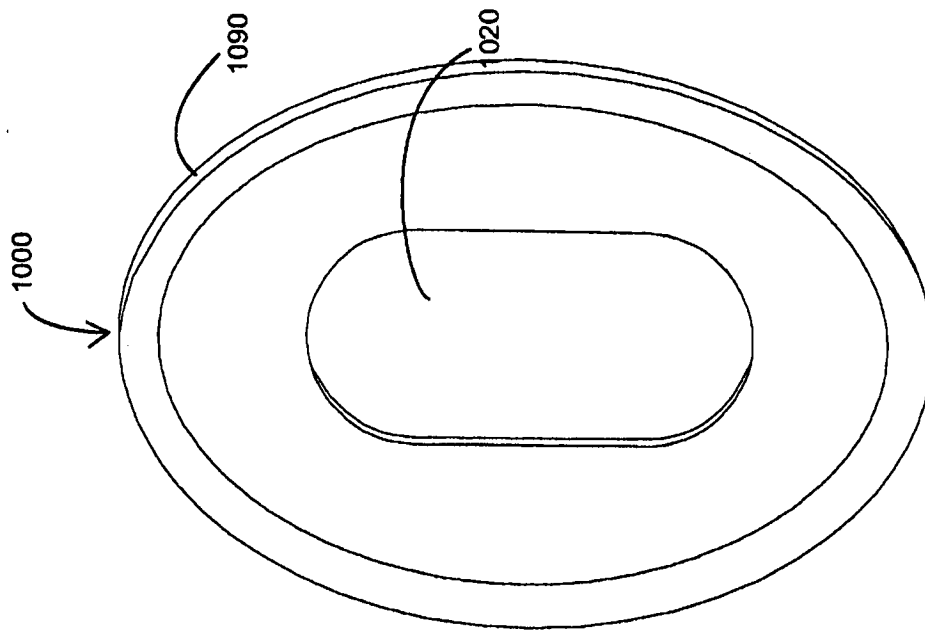


FIG. 10D

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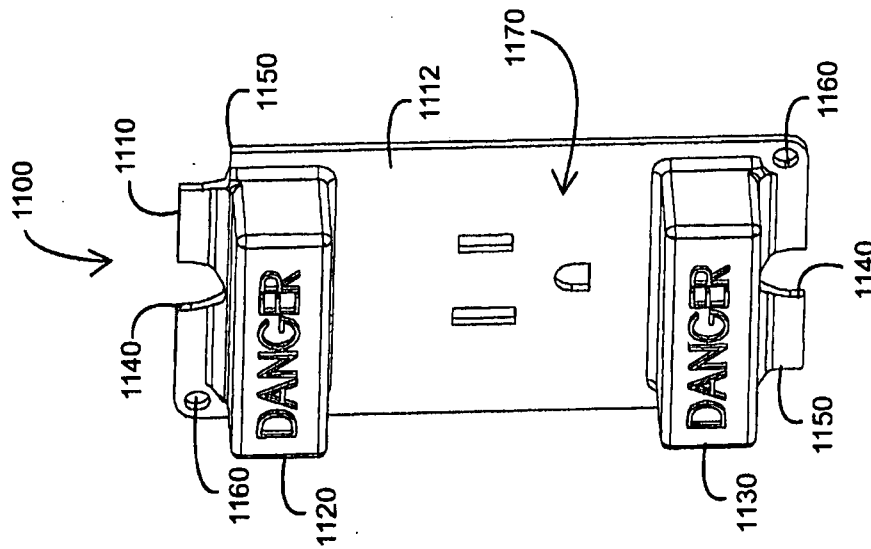


FIG. 11A

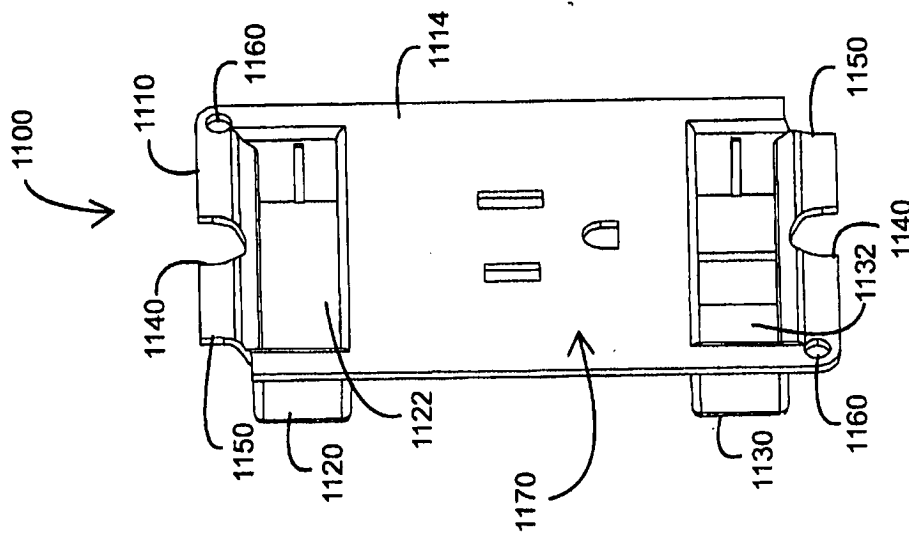


FIG. 11B

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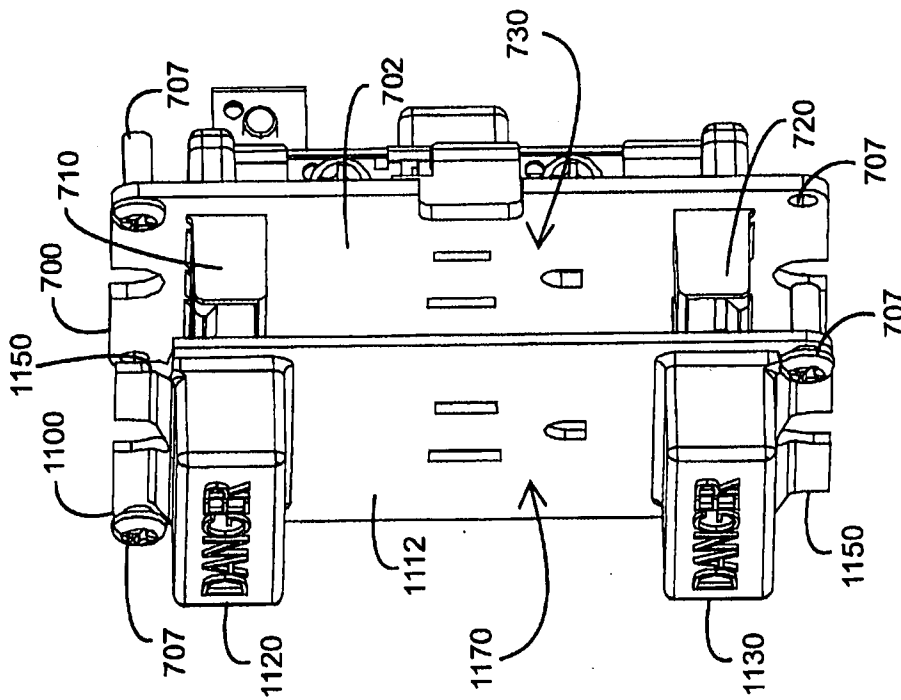


FIG. 12

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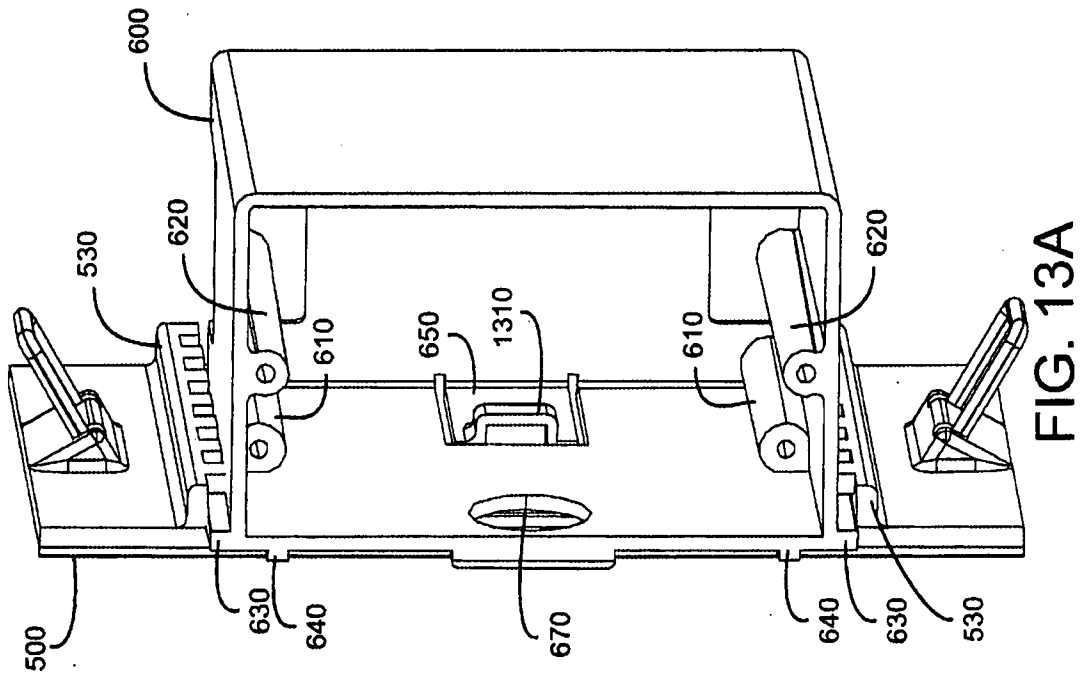


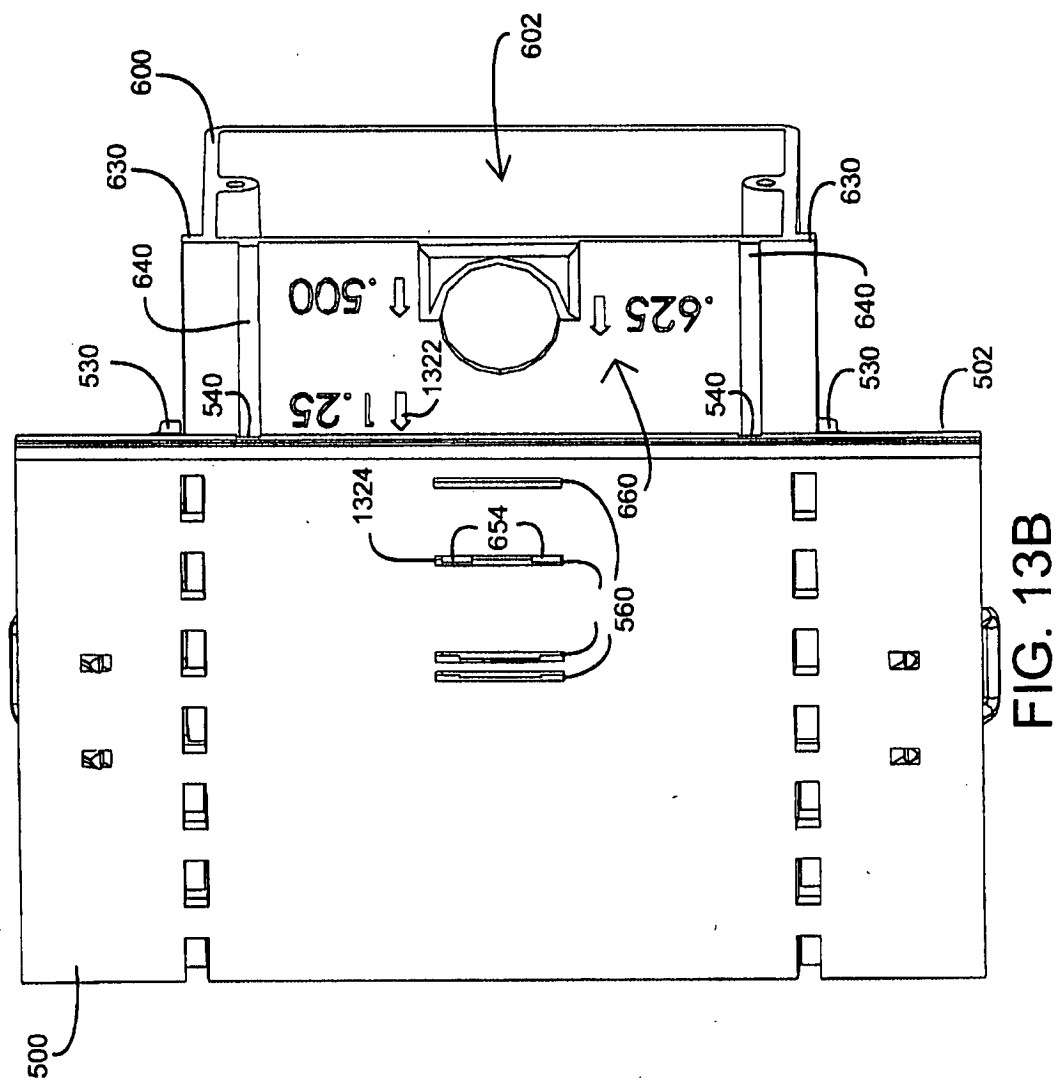
FIG. 13A

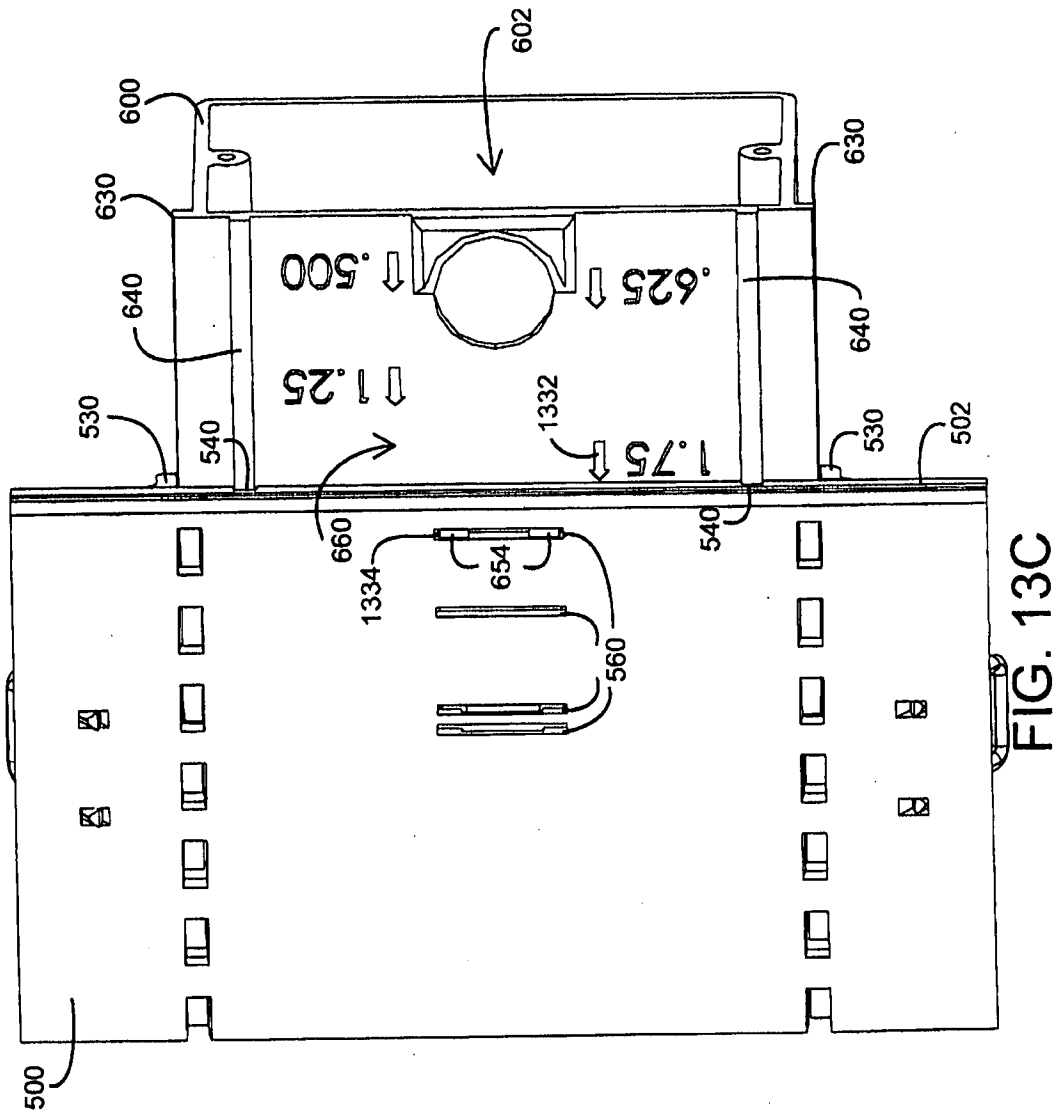
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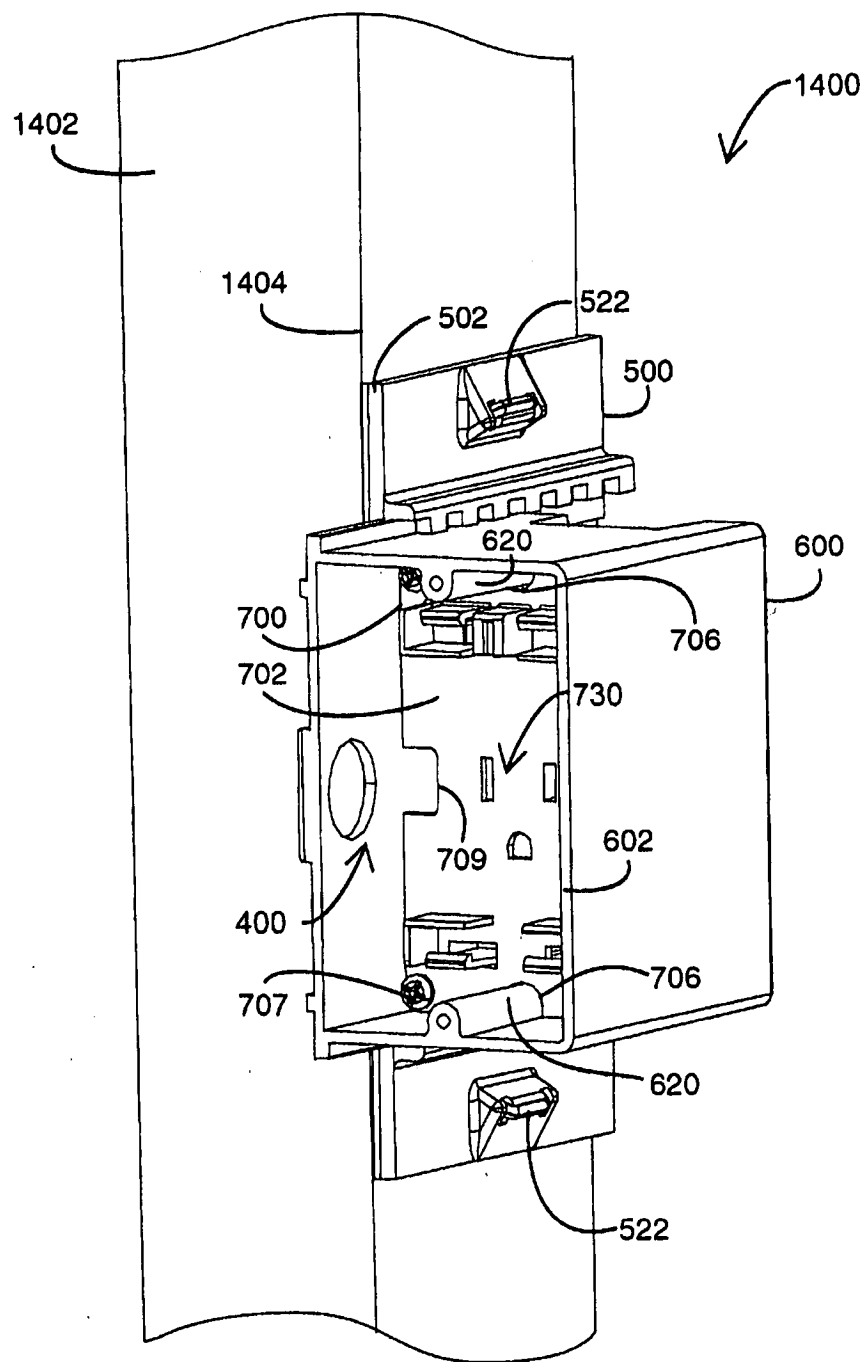


FIG. 14A

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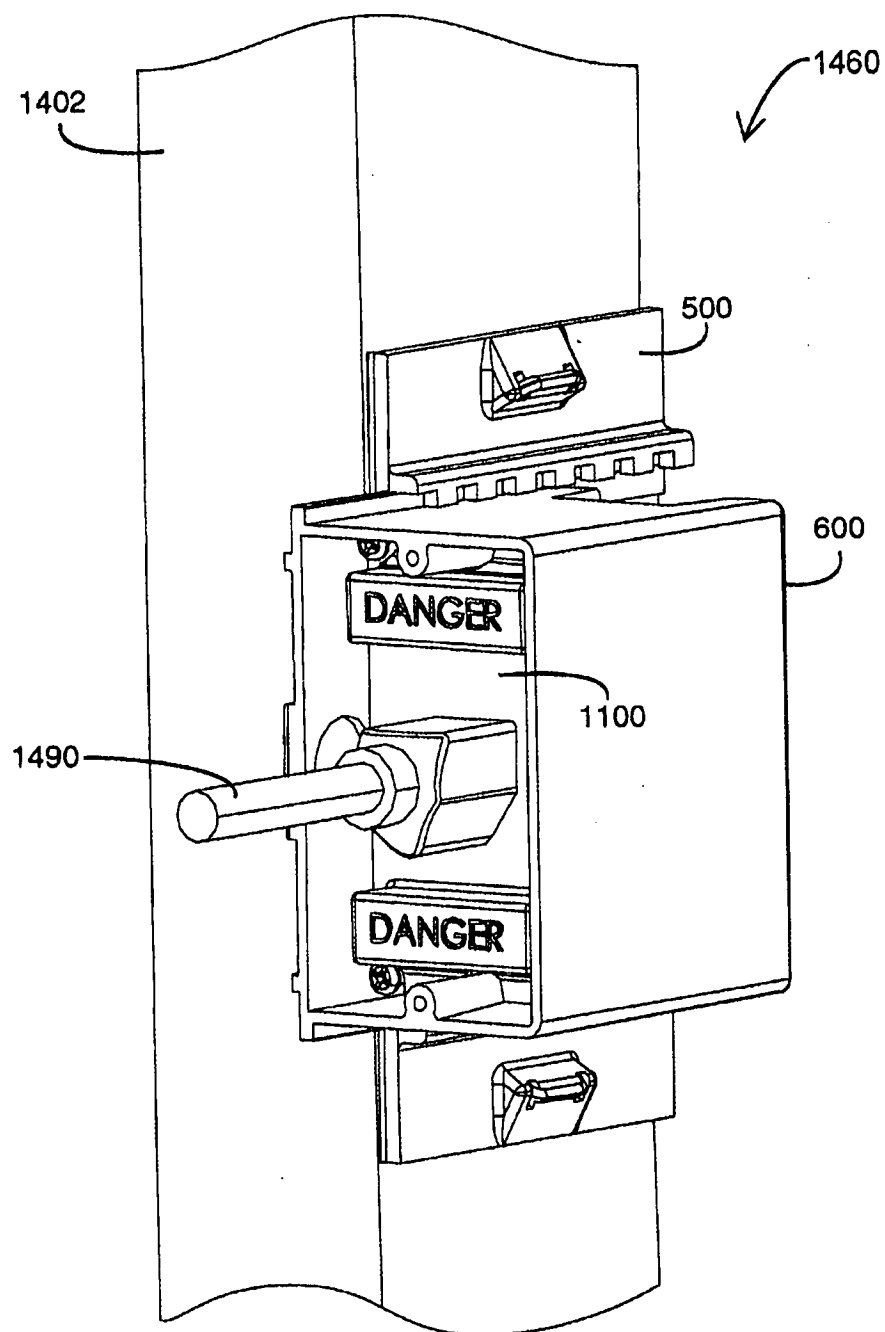


FIG. 14B

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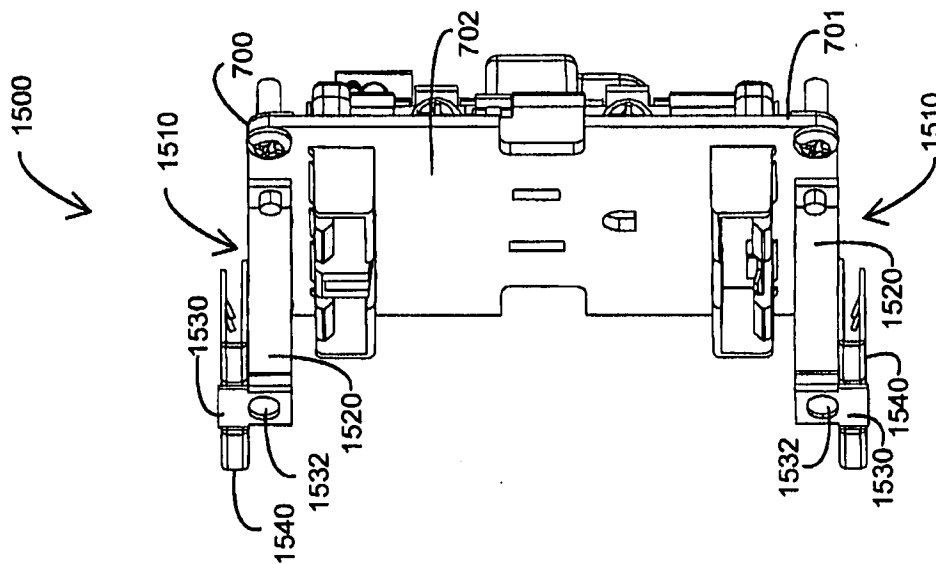


FIG. 15

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SAFETY ELECTRICAL OUTLET AND SWITCH SYSTEM

This application claims the benefit of provisional patent application No. 60/174,521 entitled Safety Electrical Wiring Assembly, filed Jan. 5, 2000.

BACKGROUND OF THE INVENTION

Installation of a standard AC electrical system in a new residence or commercial site occurs in three phases, corresponding to the building construction. The rough phase corresponds to rough framing of the building, prior to attachment of wall panels to the frame. During this phase, blue boxes or similar electrical boxes are mounted to wall studs at predetermined locations, so that outlets are 18" and switches are 36" from the floor. Various box types are available, such as single-, double-, triple- or quadruple-wide configurations, among others. After the boxes are installed, a journeyman electrician, following a predetermined layout, routes Romex® brand or equivalent power cables through the framing to the appropriate boxes. A typical power cable has two solid core insulated conductors and a ground conductor, all surrounded by a non-metallic sheath. The power cable is fed through openings in the rear or sides of the electrical boxes. The journeyman typically labels the conductors by writing a code on the insulation that indicates the wiring connectivity and the type of module to be installed in each box. Then these cables are folded back into the boxes, unterminated, so as to be out of the way until the next phase. After all of the electrical wiring is routed in this manner, the electrical subcontractors leave the construction site, waiting for other subcontractors to finish their tasks.

The makeup phase corresponds to wall panel installation and painting. During this phase, the journeyman returns to the construction site to install modules into the electrical boxes. The journeyman retrieves the cable from each box, reviews the labeling, and connects the cable conductors to the appropriate module. One module choice is a duplex outlet that receives standard two-prong or three-prong grounded AC plugs. The outlet can be wired fall-hot, where each outlet is always connected to power, or half-hot, where one outlet is connected to power under control of a wall switch. Another module choice is a switch, which can be a standard on/off switch, a three-way switch or a dimmer switch, for example. After conductors are wired to a module, the module and attached conductors are pushed into the electrical box and the module is attached to the top and bottom of the box with screws. Once all modules are installed, the general contractor verifies the dwelling wiring against the electrical plans. If all of the wiring is correct, power can be connected to the dwelling for the first time.

The final phase corresponds to construction thing and finishing work. During the trim phase, face plates are mounted over the open-end of the electrical boxes, completing the standard electrical wiring process.

SUMMARY OF THE INVENTION

Problems with Standard Wiring Construction

There are multiple problems with standard electrical wiring construction. From the electrical contractor perspective, there are unnecessary costs associated with installation. Two separate trips are required for each job site, one for the rough phase and one for the makeup phase. Further, a journeyman electrician is required for each phase. During the makeup phase, installation of the wall panels can damage the work completed during the rough phase. One way in which damage occurs is router contact with exposed

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cables when drywallers create a hole to accommodate electrical box openings. Another form of damage occurs when drywall compound or paint fouls the exposed cables, insulation and labeling.

From the general contractor perspective, there are other problems with the standard electrical wiring construction. Verification of the electrical contractor's work is not possible until after the makeup phase. Until then, the electrical cables are unterminated. After the makeup phase, however, miswiring typically requires cutouts in the installed wall panels and associated patches after corrections are completed. Further, the electrical system cannot be activated until after verification. Thus, during the rough and makeup phases, electricity for tools and lighting must be supplied by generators, which create hazards due to fumes, fuel, and noise and are an unreliable electrical source. In addition, until the trim phase is completed, unskilled personnel have access to the electrical cable. Tampering can comprise the integrity of the electrical wiring and also create a safety problem after power is activated.

From a homeowner's perspective, there are problems with repair of the standard electrical wiring. FIG. 1 illustrates a prior art electrical wiring assembly 100, which includes a standard electrical box 110 and a standard duplex outlet 120. Replacement of a broken outlet 120 first requires removal of a face plate (not shown). The screws 130 that attach the outlet 120 to the top and bottom of the electrical box 110 must be removed next. The outlet 120 is then removed from the box 110 and the conductors 140 are removed by loosening the screws 150 on the outlet sides. The process is then reversed to attach the conductors 140 to a new outlet 120 and mount the new outlet 120 into the electrical box 110.

The prior art outlet replacement procedure described above exposes the homeowner to AC wiring upon removal of the face plate. This exposure creates a shock hazard. Further, a homeowner's reluctance to change out broken outlets or to spend the money to hire an electrician also creates a shock and a fire hazard from continued use of cracked, broken or excessively worn outlets. In addition, the integrity of the original wiring becomes questionable if a homeowner or other third party removes and replaces an outlet or switch. Miswiring by a third party can violate building codes and create shock and fire hazards, such as inadvertently switching the hot and neutral conductors, failing to attach ground wires, kinking or nicking conductors and improperly tightening connections.

Benefits of the Present Invention

The safety electrical outlet and switch system according to the present invention, benefits the electrical contractor in several respects. An aspect of the present invention is an electrical box, a wiring panel installed internally to the box and associated outlet and switch modules which snap into and out of the panel without exposure to or access to electrical system wiring attached behind the panel. The journeyman's work is completed at the rough phase, when installation of the wiring panel is complete. Thus, there is no need for the journeyman to return to the job site during the makeup phase because any semi-skilled laborer, following a punch-out code or other indicator on the panel, can snap-in an appropriate outlet or switch module. Further, there is no wiring access after the rough phase, protecting wiring integrity. Also, there are no exposed conductors or parts inside the electrical box that can be inadvertently damaged during wall panel installation. A protective cover is provided that prevents fouling by drywall compound or other materials during the makeup phase.

The safety electrical outlet and switch system according to the present invention also benefits the general contractor.

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Because wiring is completed during rough framing, verification and activation of the building electrical system can be performed at the rough phase. Miswiring can be corrected before wall panels are installed and painted, eliminating cut and patch repairs. Early electrical system activation eliminates the need to use generators. Lack of third party access to the journeyman's wiring preserves integrity after verification and eliminates shock exposure to other workers.

The present invention also benefits the homeowner. Replacement of broken sockets and switches can be easily and safely accomplished. Safety is enhanced by reducing exposure to electrical wiring and encouraging replacement of defective outlets and switches. Further, maintenance costs are reduced by reducing the need to hire an electrician for repairs. Wiring integrity is insured by reducing the opportunity of unqualified third parties to access the electrical system.

Aspects of the Present Invention

One aspect of the current invention is an electrical wiring assembly comprising an electrical box having an open front face and a back face defining a power cable aperture. The assembly also comprises a generally planar wiring panel having a front side and a back side. The wiring panel front side has a panel fixture extending perpendicularly from the front side and a shielded contact surface within the panel fixture. The wiring panel back side has a cable connector. The wiring panel also has a buss electrically connecting the cable connector to the contact surface. The wiring panel is installable within the electrical box so as to define a module compartment in the interior of the electrical box between the wiring panel front side and the box open front face. The assembly also comprises an electrical module having a front cover and a back cover. The module front cover provides a user accessible electrical function. The module back cover has a module fixture and a shielded spring contact within the module fixture. The module fixture is configured to engage the panel fixture so as to connect the spring contact with the contact surface. The module has an installed position inserted into the electrical box within the module compartment and an uninstalled position removed from the electrical box. The module is removably retained by the panel in the installed position so that power cabling routed through the aperture into the electrical box and connected to the cable connector provides power to the module via the buss, the contact surface and the spring contact.

In one embodiment of the assembly described in the previous paragraph, the assembly further comprises a box mount configured to fixedly attach to a wall stud utilizing a stud alignment guide. The electrical box is attachable to the box mount and movable between a plurality of latchable positions relative to the alignment guide so as to accommodate various wall panel thicknesses. In another embodiment, the wiring panel has a socket providing access to electrical power when power cabling is attached to the cable connector. In that embodiment, the assembly further comprises a protective cover installable over the wiring panel front side and having plug openings so as to allow plug access to the wiring panel socket. In yet another embodiment, the assembly further comprises a face plate having a protruding tab. In that embodiment, the module has a corresponding catch so that the face plate removably snaps onto the module front cover. In another embodiment, the module further comprises an extractor handle having a closed position secured to the electrical box and an open position extending away from the module. In the open position, the handle clasps the module and provides a grip to extract the module from the electrical box. In still another embodiment, the module further com-

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prises a module keyed portion of the back cover. The module keyed portion corresponds to a wiring panel keyed portion of the panel fixture. The module keyed portion and said wiring panel keyed portion insuring the proper orientation of the module in the installed position.

Yet another aspect of the present invention is an electrical wiring assembly comprising an electrical box having an open front face and a back face defining a power cable aperture. The electrical box is configured to be installed with said front face generally flush with a wall panel exterior surface. The assembly further comprises a wiring panel having a generally planar board. The wiring panel is fastened within the electrical box so as to partition the interior of the electrical box into a user accessible module compartment proximate the front face and a user inaccessible wiring compartment proximate the back face. The wiring panel has a panel fixture within the module compartment and a cable connector within the wiring compartment. The panel fixture provides an electrical connection to the cable connector via a buss portion of the wiring panel. The cable connector is configured to terminate a power cable routed through the aperture into the wiring compartment. The assembly also has a user replaceable module providing a user operable electrical function. The module is installable within the module compartment by snapping the module into the panel fixture. The module is removable from the module compartment by unsnapping the module from the panel fixture. The module is electrically connected to the cable connector when installed within the module compartment.

In one embodiment of the electrical wiring assembly described in the previous paragraph, the panel fixture has a first contact and the module has a corresponding second contact. One of the first and second contacts has a latch and an associated contact surface and the other one of the first and second contacts has a spring contact. The spring contact is retained by the latch and electrically connected to the contact surface when the module is snapped into the panel fixture. In a further embodiment, of the electrical wiring assembly, portions of the panel fixture shield the first contact on all sides so as to minimize user exposure to the first contact when the module is not installed within the module compartment. In yet another embodiment, a socket portion of the wiring panel is configured to accept a standard AC plug inserted into the module compartment when the module is not installed. A corresponding plug contact portion of the wiring panel is located within the wiring compartment. The plug contact is connected to the cable connector via the buss and is configured to accept and electrically connect to a prong portion of the plug. In still another embodiment of the electrical wiring assembly, the module has an extractor handle. The handle has a closed position generally flush with the module and an open position extended from the module so as to provide a grip. The module is securable to the electrical box with the handle in the closed position and removable from the module compartment with the handle in the open position.

A further aspect of the present invention is a method of wiring an electrical box located within a wall panel to provide electrical service. The electrical box has a back face that receives a power cable and an open front face generally flush with an exterior wall panel surface. The method comprising the step of fastening a generally planar wiring panel within the electrical box so as to partition the interior of the electrical box into a user inaccessible wiring compartment and a user accessible module compartment. The method also comprises the steps of attaching the power cable to a cable connector within the wiring compartment

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and snapping a module into a panel fixture portion of the wiring panel within the module compartment, the module providing a user operable electrical function. The method further comprises the step of routing a conductive buss portion of the wiring panel between the cable connector and the panel fixture so as to provide electrical power to the module via the power cable.

In one embodiment of the method described in the previous paragraph, the snapping step comprises the substeps of providing a contact surface and an associated latch within the panel fixture, providing a spring contact within a module fixture portion of the module, coupling the module fixture and the panel fixture, and pressing the module against the wiring panel until the spring contact engages the latch and connects with the contact surface. In another embodiment, the method further comprises the steps of placing an extractor handle in a closed position and securing the module to the electrical box utilizing a fastener retained by the handle. Additional steps may include placing an extractor handle in an open position, gripping the extractor handle so as to apply a pulling force on the module directed away from the wiring panel until the spring contact disengages the latch, and removing the module from the module compartment.

Yet another aspect of the present invention is an electrical wiring assembly comprising an electrical box having an open front face and an internal mounting post located at a recess from the front face. The assembly also comprising a wiring panel having a front side and a back side, the wiring panel installed inside the electrical box with the back side abutting the mounting post. The assembly further comprising a cable connector located on the wiring panel back side configured to connect to a power cable, a prong connector electrically connected to the cable connector, and a socket located on the wiring panel front face and housing the prong connector. The cable connector is configured to connect to a power cable so that power is transmitted to a plug inserted into the socket via the power cable, the cable connector and the prong connector.

One embodiment of the electrical wiring assembly described in the previous paragraph further comprises a protective cover mounted over the wiring panel front side. The protective cover has a plug opening corresponding to the socket so that a plug inserted into the plug opening also is inserted into the socket. In another embodiment, the electrical wiring assembly further comprises a box mount attachable to a wall stud along an alignment guide. The box mount has a first catch at a first distance from the alignment guide and a second catch at a second distance from the alignment guide. The electrical box is mounted to the box mount and is slidable between a first latched position corresponding to the first catch and a second latched position corresponding to the second catch. In yet another embodiment, the recess is at least about 1.25 inches so as to avoid damage to the wiring panel during wall panel installation.

A further aspect of the present invention is a method of wiring an electrical box during the rough framing phase of building construction. The method comprises the step of attaching an electrical box to a wall stud, the electrical box having an open front face and a back face. The method also comprises the step of securing a wiring panel within the electrical box. The wiring panel is located a recessed distance from the front face sufficient to avoid interfering with wall panel installation during the subsequent makeup phase of building construction. The wiring panel has a front side facing the front face and a back side facing the back face. The back face has a cable connector and the front face has

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a socket configured to accept a standard AC plug. The socket has contacts electrically connected to the cable connector. The method further comprises the steps of routing a power cable through the back face and connecting the power cable to the cable connector and supplying electrical power to the power cable so that electrical service is available via the socket during the makeup phase.

One embodiment of the method described in the previous paragraph further comprises the step of shielding the wiring panel with a protective cover generally conforming to the front face. The protective cover has a plug opening corresponding to the socket and configured to allow a standard AC plug to be inserted through the plug opening and into the socket. In another embodiment, the attaching step comprises the substeps of attaching a box mount to a wall stud so that an alignment guide of the box mount matches a wall stud edge and mounting the electrical box onto the box mount so that the electrical box slides relative to the box mount in a direction generally perpendicular to the wall stud. The attaching step also comprises the substeps of locating a plurality of fixed positions for the electrical box along the box mount and releasably locking the box in one of the positions so as to accommodate the thickness of a wall panel installed on the wall stud. Each of the positions provide a specific distance between the front face and the alignment guide. The method may also comprise the further substep of providing a plurality of position indicators on the box mount. A particular one of the positions is associated with a particular one of the indicators. The particular one of the indicators visibly shows a specific distance from the alignment guide to the box front face for the particular one of the positions.

Another aspect of the present invention is an electrical box assembly comprising a box mount attachable to a wall stud in accordance with a stud alignment guide of the box mount. The assembly also comprises a plurality of catches located along the box mount and an electrical box having a front face. The box is slidably attached to the box mount. A latch portion of the box is configured to releasably engage any of the catches. The box has a plurality of fixed positions corresponding to the catches. Each of the positions places the front face at a specific distance from the alignment guide so that the electrical box can be adjusted for various wall panel thicknesses.

One embodiment of the assembly described in the above paragraph, further comprises a plurality of position indicators located on the electrical box and associated with the positions. Each of the indicators displays a corresponding distance from the alignment guide to the front face. The corresponding distance may be in the range of 0.5 inches to 1.75 inches. In another embodiment, the alignment guide is the leading edge of the box mount and each of the position indicators aligns with the leading edge to indicate the current distance between the front face and the leading edge. In a further embodiment, the assembly also comprises a side of the electrical box defining a finger aperture. The aperture provides a grip to move the electrical box between the positions. In yet another embodiment, the latch portion has a latch release portion configured to accept a tool to pry the latch from a particular one of the catches.

Yet another aspect of the present invention is a method of installing an electrical box having an open front face. The method comprises the steps of attaching a box mount to a wall stud so that an alignment guide of the box mount matches a wall stud edge and mounting the electrical box onto the box mount so that the electrical box slides relative to the box mount in a direction generally perpendicular to

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the wall stud. The method comprises the further steps of locating a plurality of fixed positions for the electrical box along said box mount and latching the box in one of the positions so as to accommodate the thickness of a wall panel installed on the wall stud. Each of the positions provides a specific distance between the front face and the alignment guide.

In a particular embodiment of the method described in the previous paragraph, the latching step comprises the substeps of measuring a specific distance from the exterior surface of the wall panel and the proximate edge of the wall stud, releasing a latch portion of the box, sliding the box to a position relative to the box mount where a position indicator corresponding to the specific distance is displayed, and engaging the latch in a corresponding catch slot of the box mount so as to lock the box in a fixed position associated with the position indicator.

Another aspect of the current invention is an electrical wiring assembly comprising an electrical box means for mounting in a wall, a wiring panel means for attaching power cables, a wiring panel means installed within the electrical box means, a module means for providing an electrical function installable within the electrical box means, and a snap-in means for removably attaching and electrically connecting the module means to the wiring panel means. In a particular embodiment, the assembly further comprises a box mount means for attaching the electrical box to a wall stud. In another embodiment, the electrical wiring assembly further comprises a protective cover means for shielding the wiring panel during the makeup phase of building construction. In yet another embodiment, the electrical wiring assembly further comprises a face plate means for trimming the module when installed within the electrical box.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a prior art outlet electrical wiring assembly;

FIG. 2 is a perspective view of a safety electrical outlet and switch system according to the present invention;

FIGS. 3A-B are exploded perspective views of an outlet assembly and a switch assembly, respectively, of the safety electrical outlet and switch system, illustrating box mount, electrical box, wiring panel, snap-in electrical modules and face plate portions;

FIGS. 4A-F are perspective views illustrating the removal and installation of snap-in electrical modules;

FIG. 4A is a front perspective view of an installed snap-in outlet module;

FIG. 4B is a front perspective view of an unfastened snap-in outlet module with extended extractor handles;

FIG. 4C is a front perspective view of an uninstalled snap-in outlet module;

FIG. 4D is a front perspective view of an uninstalled snap-in switch module;

FIG. 4E is a front perspective view of an outlet module installed in a wiring panel;

FIG. 4F is a front perspective view of a switch module installed in a wiring panel;

FIGS. 5A-B are front and back perspective views, respectively, of a box mount;

FIGS. 6A-B are front and back perspective views, respectively, of an electrical box;

FIGS. 7A-F are perspective views of a wiring panel;

FIGS. 7A-B are front and back perspective views, respectively, of an assembled wiring panel;

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FIG. 7C is a back perspective view of a wiring panel board;

FIG. 7D is a front perspective view of a wiring panel back cover;

FIGS. 7E-F are back and front perspective views, respectively, of wiring panel internal conductors;

FIGS. 8A-F are perspective views of an outlet module;

FIGS. 8A-B are front and back perspective views, respectively, of an assembled outlet module;

FIG. 8C is a front perspective view of a mounting bracket;

FIG. 8D is a back perspective view of an outlet module front cover;

FIG. 8E is a front perspective view of an outlet module back cover;

FIGS. 8F-G are back and front perspective views, respectively, of outlet module internal conductors;

FIGS. 9A-F are perspective views of a switch module;

FIGS. 9A-B are front and back perspective views, respectively, of an assembled switch module;

FIG. 9C is a back perspective view of a switch module front cover;

FIG. 9D is a front perspective view of a switch module back cover;

FIGS. 9E-F are back and front perspective views, respectively, of switch module internal conductors;

FIGS. 10A-D are perspective views of snap-on face plates;

FIGS. 10A-B are front and back perspective views of a flared rectangular face plate;

FIG. 10C is a front perspective view of a rectangular face plate;

FIG. 10D is a front perspective view of an oval face plate;

FIGS. 11A-B are front and back perspective views, respectively, of a protective cover;

FIG. 12 is a front perspective view of a protective cover and a wiring panel illustrating installation of the protective cover over the wiring panel;

FIGS. 13A-C are front perspective views of a mounted electrical box;

FIG. 13A is a electrical-box-side front perspective view of a mounted electrical box illustrating the releasable latch inside the box;

FIG. 13B-C are mounting-bracket-side front perspective views of a mounted electrical box, illustrating the box in first and second positions, respectively, relative to the box mount;

FIGS. 14A-B are front perspective views of a mounted electrical box and associated components installed on a wall stud;

FIG. 14A is a perspective view of a mounted electrical box with an installed wiring panel, illustrating box mount alignment;

FIG. 14B is a perspective view of a mounted electrical box with an installed protective cover illustrating plug accessibility to electrical power during the rough framing phase of construction; and

FIG. 15 is a front perspective view of an adapter wiring panel.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

System Overview

FIG. 2 illustrates one embodiment of an installed safety electrical outlet and switch system 200 according to the present invention. As shown in FIG. 2, the outlet and switch system 200 comprises a outlet assembly 310 and a switch assembly 360. Each of these assemblies 310, 360 provide a user-accessible electrical function. The outlet assembly 310 is mounted in a wall 210 and functions to supply a user with electrical power through a conventional AC plug inserted into an outlet module 800. The switch assembly 360 is also mounted in the wall 210 and functions to allow a user to control electrical power to an outlet, a light or any of various electrical devices (not shown) by actuating a switch module 900. The installed outlet assembly 310 includes a face plate 1000 and an outlet module 800 mounted so that its visible portion is generally flush with the face plate 1000. The installed switch assembly 360 includes a face plate 1000 and a switch module 900 mounted so that its visible portion is in a plane generally parallel with the face plate 1000. The face plates 1000 are interchangeable between the outlet assembly 310 and switch assembly 360 and include a flared rectangular face plate, a rectangular face plate and an oval face plate, as described with respect to FIGS. 10A-D, below. Conveniently, the face plates 1000 attach to or are removed from the outlet assembly 310 or switch assembly 360 without the need for separate fastening devices, such as screws, and associated tools, as described with respect to FIG. 10B, below.

FIGS. 3A-B illustrate embodiments of a safety electrical outlet and switch system, comprising an outlet assembly 310 (FIG. 3A) and a switch assembly 360 (FIG. 3B). As shown in FIG. 3A, an outlet assembly 310 comprises a box mount 500, an electrical box 600, a wiring panel 700, an outlet module 800 and a face plate 1000. As shown in FIG. 3B, a switch assembly 360 comprises a box mount 500, an electrical box 600, a wiring panel 700, a switch module 900 and a face plate 1000. The box mount 500, electrical box 600, wiring panel 700, outlet module 800 (FIG. 3A), switch module 900 (FIG. 3B), and face plate 1000 are described in detail below with respect to FIGS. 5A-B, 6A-B, 7A-F, 8A-G, 9A-F and 10A-D, respectively. In one embodiment, the main structural components of the box mount 500, electrical box 600, wiring panel 700, outlet module 800, switch module 900, face plate 1000 and protective cover 1100 (FIG. 11) are composed of thermoplastics, such as nylon, polycarbonate or ABS. In that embodiment, the conductive components of the wiring panel 700, outlet module 800 and switch module 900 are brass or copper alloys. One of ordinary skill in the art will recognize that other materials can be used for the structural and conductive components of the present invention.

FIGS. 4A-F illustrate removal and installation of a snap-in outlet module 800 (FIG. 4C) or a snap-in switch module 900 (FIG. 4D). FIG. 4A shows an installed outlet assembly 310 with the face plate 1000 (FIG. 3A) removed. An outlet module 800 is removably attached to the wiring panel 700 (FIG. 4C) and secured with fasteners 809 to the electrical box 600.

FIG. 4B shows the outlet module 800 during removal from, or installation into, the electrical box 600. During removal, the fasteners 809 are unfastened to release the outlet module 800 from the electrical box 600 and extend the extractor handles 824, as shown. The extended extractor handles 824 are manually gripped and pulled to unsnap the outlet module 800 from the wiring panel 700 (FIG. 4C). The

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outlet module 800 is then removed from electrical box 600, as shown in FIG. 4C. During installation, the process is reversed. The extended extractor handles 824 are pushed into the outlet module 800, and the outlet module 800 is secured to the electrical box 600, as shown in FIG. 4A, using the fasteners 809 to attach to the module mounting posts 620 (FIG. 4C).

FIG. 4C shows an outlet module 800 during installation into or removal from the electrical box 600. For installation, the outlet module 800 is placed at the electrical box open front face 602, as shown. The outlet module 800 is then inserted into the module compartment 400 interior to the electrical box 600 between the front face 602 and the wiring panel 700. The top module fixture 830 and bottom module fixture 840 engage the top panel fixture 710 and bottom panel fixture 720, respectively. The outlet module 800 is then pressed against the wiring panel 700, which snaps the outlet module 800 into the wiring panel 700, electrically connecting the outlet module 800 and wiring panel 700. The outlet module 800 is then secured to the electrical box 600, as described above with respect to FIG. 4B.

FIG. 4D shows a switch module 900 during installation into or removal from the electrical box 600. For installation, the switch module 900 is placed at the electrical box front face 602, as shown. The switch module 900 is then inserted into the module compartment 400 interior to the electrical box 600. The top module fixture 930 and bottom module fixture 940 engage the top panel fixture 710 and bottom panel fixture 720, respectively. The switch module 900 is then pressed against the wiring panel 700, which snaps the switch module 900 into the wiring panel 700, electrically connecting the switch module 900 and wiring panel 700. The switch module 900 is then secured to the electrical box 600, in a manner similar to that described above with respect to FIG. 4B.

FIG. 4E shows the outlet module 800 installed into the wiring panel 700. The outlet module back cover 804 faces the wiring panel front side 702. The wiring panel top guides 712 fit within the outlet module top slots 834, and the wiring panel bottom guides 722 fit within the outlet module bottom slots 844.

FIG. 4F shows the switch module 900 installed into the wiring panel 700. The switch module back cover 904 faces the wiring panel front side 702. The wiring panel top guides 712 fit within the switch module top slots 934, and the wiring panel bottom guides 722 fit within the switch module bottom slots 944.

Box Mount

FIGS. 5A-B show a box mount 500, which attaches to a framing stud and provides a slidable attachment for the electrical box 600 (FIGS. 6A-B). As shown in FIG. 5A, the box mount 500 has a stud plate 510, fastener holders 520, mounting brackets 530, grooves 540, a latch channel 550 and catch slots 560. The stud plate 510 has a box side 512, a stud side 518 (FIG. 5B), and a leading edge 502 that functions as a stud alignment guide. The fastener holders 520 receive and retain fasteners 522, such as staples as shown. The box mount 500 is attached to a wall stud with the stud side 518 flush against the stud and with the leading edge 502 aligned with a stud edge. The fasteners 522 are hammered or otherwise driven into the stud through apertures 570 (FIG. 5B) on the stud side 518 (FIG. 5B). Attachment of the box mount to a wall stud is described in further detail with respect to FIG. 14A, below. The electrical box 600 (FIGS. 6A-B) is attached to the box mount 500 by placing the electrical box 600 (FIGS. 6A-B) adjacent the area between the mounting brackets 530, with the latch 650

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(FIGS. 6A-B) adjacent the channel 550. The slides 630 (FIGS. 6A-B) are inserted into the mounting brackets 530 and the guides 640 (FIGS. 6A-B) into the grooves 540, as described in further detail with respect to FIG. 13A, below. The catch slots 560 removably retain the electrical box 600 (FIGS. 6A-B) at various fixed positions, as described in further detail with respect to FIGS. 13B-C, below.

Electrical Box

FIGS. 6A-B illustrate an electrical box 600. The electrical box 600 has outer dimensions generally consistent with conventional electrical boxes. The electrical box 600 has an open front face 602 and a back face 604. As shown in FIGS. 6A-B, the electrical box 600 has a mounting side 606 and an opposite gripping side 608. The mounting side 606 has slides 630, guides 640, a latch 650, position indicators 660, a finger grip 670 and apertures 680. The slides 630 and guides 640 mate with corresponding brackets 530 (FIG. 5A) and grooves 540 (FIG. 5A) on the box mount 500 (FIGS. 5A-B), as described with respect to FIG. 13A, below. The latch 650 has a spring portion 652 and a tab portion 654. The spring portion 652 is attached to the electrical box 600 along the back face 604 and extends along the mounting side 606, terminating with the tab portion 654. The tab portion 654 extends from the spring portion 652 generally perpendicularly to the mounting side 606, away from the electrical box 600. When the electrical box 600 is attached to the box mount 500 (FIGS. 5A-B), the catch 654 is configured to engage in any of the catch slots 560 (FIGS. 5A-B). The finger grip 670 is utilized to manually grip and position the electrical box 600 relative to the box mount 500 (FIGS. 5A-B) according to the position indicators 660, as described in further detail with respect to FIGS. 13B-C, below. The apertures 680 are located on the back face 604 for routing power cable through the back face 604 and into the interior of the electrical box 600. In another embodiment, a center aperture (not shown) is included, also for routing power cable into the interior of the electrical box 600.

As shown in FIGS. 6A-B, the front face 602 and interior of the electrical box 600 are configured for installment of the wiring panel 700 (FIGS. 7A-B), the protective cover 1100 (FIG. 11A-B), the outlet module 800 (FIGS. 8A-B) and the switch module 900 (FIGS. 9A-B). The interior of the electrical box 600 includes panel mounting posts 610 located along each interior corner edge and module mounting posts 620 located along the center of the interior top and bottom faces. Each of the panel mounting posts 610 is recessed from the front face 602 and has a centered hole 612. In one embodiment, the panel mounting posts 610 are recessed at least about 1.25 inches from the front face 602 to avoid damage to the installed wiring panel 700 (FIGS. 7A-B) during the makeup phase of construction and, in particular, during wall panel installation. Each of the module mounting posts 620 is flush with the front face 602 and has a centered hole 622.

The wiring panel 700 (FIGS. 7A-B) is installed in the interior of the electrical box 600 with panel back side 704 (FIG. 7B) abutting the panel mounting posts 610. The wiring panel 700 (FIGS. 7A-B) is secured within the electrical box 600 with fasteners 707 (FIG. 7C) threaded or otherwise inserted into the centered holes 612, as described with respect to FIG. 14A, below. Similarly, the protective cover 1100 (FIGS. 11A-B) is installed in the interior of the electrical box 600 against the panel mounting posts 610 and secured with fasteners 707 (FIG. 12) inserted through the centered holes 612, as described with respect to FIG. 14B, below. The outlet module 800 (FIGS. 8A-B) and the switch module 900 (FIGS. 9A-B) are snapped into the wiring panel

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700 (FIGS. 7A-D) and secured to the module mounting posts 620 with the fasteners 809 (FIGS. 4A-D) threaded or otherwise inserted into centered holes 622, as described with respect to FIGS. 4A-D, above.

Wiring Panel

FIGS. 7A-F illustrate the generally planar wiring panel 700, which has a board 701, internal conductors 703, a back cover 705 and fasteners 707. The board 701 (FIG. 7C) retains the internal conductors 703 (FIGS. 7E-F), the back cover 705 (FIG. 7D) and the fasteners 707 (FIG. 7C) of the assembled wiring panel 700 (FIGS. 7A-B). FIGS. 7A-B illustrate the assembled wiring panel 700.

As shown in FIGS. 7A-B, the wiring panel 700 has a front side 702 and a back side 704. As shown in FIG. 7A, the front side 702 has a top panel fixture 710, a bottom panel fixture 720 and a socket 730. The top panel fixture 710 and bottom panel fixture 720 are configured to accept, removably retain and electrically connect to an outlet module 800 (FIGS. 8A-B), a switch module 900 (FIGS. 9A-B) or similar module that provides a user-accessible electrical functions. The top panel fixture 710 has top guides 712, top latches 714, top panel contacts 756, 766 and a ground connector 718, all extending in a direction normal to the front side 702. A ground panel contact 776 (FIG. 7F) is accessible through the ground connector 718. The bottom panel fixture 720 has bottom guides 722, bottom latches 724 and bottom panel contacts 757, 767, also all extending in a direction normal to the front side 702.

Also shown in FIG. 7A, the socket 730 has a hot slot 732, a neutral slot 734 and a ground hole 736. The socket 730 is configured to accept and electrically connect to a standard plug, which is inserted into the socket 730 so that the plug's hot prong, neutral prong and ground post enters the hot slot 732, neutral slot 734 and ground hole 736, respectively, and electrically connects with the hot socket contact 758 (FIGS. 7E-F), neutral socket contact 768 (FIGS. 7E-F) and ground socket contact 778 (FIGS. 7E-F), respectively.

One particularly advantageous feature of the wiring panel 700 is the socket 730. The socket 730 allows power to be supplied to a construction crew after the wiring panel 700 has been wired and building electrical system tested and activated, prior to the makeup phase, as described in further detail with respect to FIGS. 14A-B, below. Another particularly advantageous feature is that a user's exposure to the top panel contacts 756, 766 is minimized by the top guides 712, top latches 714 and ground connector 718 that shield the top panel contacts 756, 766 on all four sides and the front. Further, the ground connector 718 separates the first top panel contact 756 from the second top panel contact 766, reducing the possibility of a short between the top panel contacts 756, 766. Similarly, the bottom guides 722 and bottom latches 724 shield the bottom panel contacts 757, 767 from the sides and the front.

As shown in FIG. 7B, the wiring panel back side 704 has a back cover 705, first buss cable connectors 752, 754, second buss cable connectors 762, 764 and a ground buss cable connector 772. A first buss breakaway 755 can be removed during wiring of the wiring panel 700 in order to isolate the first buss top cable connector 752 from the first buss bottom cable connector 754. Similarly, a second buss breakaway 755 can be removed in order to isolate the second buss top cable connector 762 from the second buss bottom cable connector 764. During installation of the wiring panel 700 into the electrical box 600 (FIG. 6A-B), described with respect to FIG. 14A, below, one or more electrical cables, such as power or equivalent, are routed through the electrical box apertures 680 and the wires within the cables are

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attached to the cable connectors 752, 754, 762, 764. The wire connections are made by hooking an uninsulated conductor portion of the wires around the respective screws of the cable connectors 752, 754, 762, 764 and tightening the screws so that the conductors are secured between the screws and their respective busses 750, 760, 770 (FIGS. 7E-F), as is well-known in the art. The particular wiring configuration is a function of a master wiring plan for the building under construction and the module type to be installed in the wiring panel 700. Several wiring panel 700 wiring configurations are described below.

FIG. 7C illustrates the back side 704 of the wiring panel board 701, which has mounting post slots 706, mounting holes 708 and grips 709. These features are used to install the wiring panel 700 and secure it with fasteners 707 within the electrical box 600 (FIGS. 6A-B), as described with respect to FIG. 14A, below. The wiring panel board 701 also has raised chambers 782, 784, 786 that retain the internal conductors 703 (FIGS. 7E-F) and binding sockets 781.

FIG. 7D illustrates the front of the wiring panel back cover 705. The back cover 705 has a connector aperture 792 that accommodates the ground buss cable connector 772 (FIG. 7B), prong apertures 794, 796 that accommodate the prongs of a standard plug inserted into the wiring panel socket 730 (FIG. 7A), and a ground post aperture 798 that accommodates the ground post of the inserted standard plug. Binding posts 791 press-fit into corresponding binding sockets 781 (FIG. 7C) on the panel back side 704 (FIG. 7C) for joining the back cover 705 to the wiring panel board 701 (FIG. 7C).

As shown in FIGS. 7E-F, the internal conductors 703 include a first buss 750, a second buss 760 and a ground buss 770. The busses 750, 760, 770 are retained within the wiring panel board raised chambers 782, 784, 786, respectively. The first buss 750 electrically connects the first top panel contact 756, the first buss top cable connector 752, the first buss breakaway 755, the first bottom panel contact 757, the first buss bottom cable connector 754 and the hot socket contact 758. Similarly, the second buss 760 electrically connects the second top panel contact 766, the second buss top cable connector 762, the second buss breakaway 765, the second bottom panel contact 767, the second buss bottom cable connector 764 and the neutral socket contact 768. The ground buss 770 electrically connects the ground panel contact 776, the ground buss cable connector 772 and the socket ground contact 778. If the first buss breakaway 755 is removed, the first top panel contact 756 and the first buss top cable connector 752 are electrically isolated from the first bottom panel contact 757, the first buss bottom cable connector 754 and the hot socket contact 758. Likewise, if the second buss breakaway 765 is removed, the second top panel contact 766 and the second buss top cable connector 762 are electrically isolated from the second bottom panel contact 767, the second buss bottom cable connector 764 and the neutral socket contact 768. The panel contacts 756, 766, 757, 767 provide contact surfaces for electrical connection to outlet module contacts 856, 866, 857, 867 or switch module contacts 956, 966, 957, 967 as described with respect to FIGS. 8F-G and FIGS. 9E-F, below.

Outlet Module

FIGS. 8A-G illustrate an outlet module 800, which has a front cover 802, an attachment assembly 820, a back cover 804 and internal conductors 806. FIGS. 8A-B illustrate an assembled outlet module 800, FIG. 8C illustrates the front of the attachment assembly 820, FIG. 8D illustrates the back of the outlet module front cover 802, FIG. 8E illustrates the front of the outlet module back cover 804, and FIGS. 8F-G

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illustrate the outlet module internal conductors 806. As shown in FIG. 8A, the front cover 802 and back cover 804 are glued, welded or otherwise attached together to form the body of the outlet module 800. The attachment assembly 820 is retained by the front cover 802, as described with respect to FIG. 8C, below, and provides the means to secure the outlet module 800 to an electrical box 600 (FIGS. 6A-B). The front cover 802 has a raised socket portion 810, which includes a top socket 811 and a bottom socket 816, each compatible with a standard AC plug. The top socket 811 has a hot slot 812, a neutral slot 813 and a ground post hole 814, which provide plug access to the top socket contacts 854, 864, 874 (FIGS. 8F-G). Similarly, the bottom socket 816 has a hot slot 817, a neutral slot 818 and a ground post hole 819, which provide plug access to the bottom socket contacts 855, 865, 875 (FIGS. 8F-G).

As shown in FIG. 8B, the back cover 804 includes a top module fixture 830 and a bottom module fixture 840. The top module fixture 830 includes top contact housings 832 and top slots 834. The bottom module fixture 840 includes bottom contact housings 842, bottom slots 844, and a module key 846. The top contact housings 832 contain top outlet contacts 856, 866, and the bottom contact housings 842 contain bottom outlet contacts 857, 867. A ground bar 876 extends from the back cover 804 between the top contact housings 832.

As shown in FIG. 8C, the attachment assembly 820 includes a bracket 822 and extractor handles 824. The bracket 822 is a one-piece conductive element that fits around the outside of the front cover 802. The sides of the front cover 802 (FIG. 8D) include protruding cover catches 803 (FIG. 8D) that extend through bracket slots 823 to retain the attachment assembly 820 and to retain a cover plate 1000 (FIGS. 10A-D), as described with respect to FIG. 10B, below. The extractor handles 824 are moveably retained by the bracket 822, and each handle 824 has a crossbar 826 and arms 828. At the tip of each handle arm 828 is a clasp 829. In the center of each handle crossbar 826 is a fastener hole 827. A fastener 809, such as a screw or equivalent, is moveably retained within the fastener hole 827. The extractor handles 824 each have a closed position, shown at the top of FIG. 8C, and an open position, shown at the bottom of FIG. 8C. In the closed position, the handles 824 are pushed in so that the crossbar 826 fits against the bracket 822. In the open position, the handles 824 are pulled out so that they extend away from the bracket 822, with the arm clasps 829 each clamping an edge portion of the bracket 822. With the handles 824 in the closed position, the outlet module can be secured to an electrical box 600 (FIGS. 6A-B), as described with respect to FIG. 4A, above. With the handles 824 in the open position, the outlet module can be removed from a wiring panel 700 (FIGS. 7A-B), as described with respect to FIGS. 4B, above.

As shown in FIG. 8D, the front cover 802 has binding posts 883 that press-fit into corresponding binding sockets 893 (FIG. 8E) on the back cover 804 (FIG. 8E) for joining the front cover 802 and back cover 804 (FIG. 8E). The front cover 802 also has a raised portion 881 that retains the ground buss 870 (FIGS. 8F-G) and the adjacent top and bottom busses 851, 852, 861, 862 (FIGS. 8F-G).

As shown in FIG. 8E, the back cover 804 has top recessed portions 891 within the top contact housings 832 that retain the top outlet contacts 856, 866 (FIGS. 8F-G). Similarly, the back cover 804 has bottom recessed portions 892 within the bottom contact housings 842 that retain the bottom outlet contacts 857, 867 (FIGS. 8F-G).

As shown in FIGS. 8F-G, the internal conductors 806 of the outlet module 800 include a top hot buss 851, a bottom

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hot buss 852, a top neutral buss 861, a bottom neutral buss 862, and a ground buss 870. The top hot buss 851 has a top socket hot contact 854 and a top hot module contact 856. The bottom hot buss 852 has a bottom socket hot contact 855 and a bottom hot module contact 857. The top neutral buss 861 has a top socket neutral contact 864 and a top neutral module contact 866. The bottom neutral buss 862 has a bottom socket neutral contact 865 and a bottom neutral module contact 867. The ground buss 870 has a ground bar 876, a top socket ground contact 874 and a bottom socket ground contact 875.

Outlet Module Installation

In reference to FIG. 8B, an outlet module 800 is installed in an electrical box 600 (FIGS. 6A-B) as described with respect to FIGS. 4A-C, E above. An outlet module 800 and the wiring panel 700 (FIGS. 7A-B) are keyed to prevent the installation of an outlet module 800 into a module compartment 400 (FIG. 4C) with an incorrect, i.e. upside-down orientation. Specifically, the module key 846 must engage the bottom panel fixture 720 (FIG. 7A) and the ground bar 876 must engage the ground connector 718 (FIG. 7A) for proper module orientation. The module key 846 will not engage the top panel fixture 710 (FIG. 7A) and the ground bar 876 will not engage the bottom panel fixture 720 (FIG. 7A) in the improper orientation. That is, the module key 846 and ground bar 876 function as keyed structures of the outlet module 800, and the ground connector 718 (FIG. 7A) and bottom panel fixture 720 (FIG. 7A), in particular the gap between the guides and latches 722, 724 (FIG. 7A), function as keyed structures of the wiring panel 700 (FIG. 7A). The keyed structures of the outlet module 800 and the corresponding keyed structures of the wiring panel 700 (FIG. 7A) insure proper orientation of the installed outlet module 800.

In reference to FIGS. 8F-G, when an outlet module 800 (FIGS. 8A-B) is attached to a wiring panel 700 (FIGS. 7A-B), the top hot module contact 856 is electrically connected to the first top panel contact 756 (FIGS. 7E-F), the top neutral module contact 866 is electrically connected to the second top panel contact 766 (FIGS. 7E-F), the bottom hot module contact 857 is electrically connected to the first bottom panel contact 757 (FIGS. 7E-F), and the bottom neutral module contact 867 is electrically connected to the second bottom panel contact 767 (FIGS. 7E-F). In this configuration, if the wiring panel 700 (FIGS. 7A-B) is wired in a full-hot configuration, as described below, then the top 851 and bottom 852 hot busses are hot, the top 861 and bottom 862 neutral busses are neutral and the ground buss 870 is grounded. In this manner, the top socket contacts 854, 864, 874 provide power to a standard AC plug inserted into the top socket 811 (FIG. 8A) and the bottom socket contacts 855, 865, 875 provide power to a standard AC plug inserted into the bottom socket 816 (FIG. 8A). Similarly, if the wiring panel 700 (FIGS. 7A-B) is wired in a half-hot configuration, as described below, then a standard AC plug inserted into (typically) the bottom socket 816 (FIG. 8A) is provided power and a standard plug inserted into (typically) the top socket 811 (FIG. 8A) is provided switched power.

Also in reference to FIGS. 8F-G, the outlet module contacts 856, 857, 866, 867 are spring contacts each extending from busses 851, 852, 861, 862 and each having a generally V-shaped contact point. During installation, as the outlet module 800 (FIGS. 8A-B) is pressed against the wiring panel 700 (FIGS. 7A-B) the top and bottom module contacts 856, 857, 866, 867 press against the corresponding top latches 714 (FIG. 7A) and bottom latches 724 (FIG. 7A). These latches 714, 724 (FIG. 7A) are flexible, spring-like structures extending from the wiring panel board 701 (FIG.

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7A) and having a hooked tip. When sufficient pressing force is applied, the spring contacts 856, 857, 866, 867 and the spring latches 714, 724 (FIG. 7A) flex until the contact points pass over and clear the hooked tips and connect with the contact surfaces of the panel contacts 756, 757, 766, 767 (FIG. 7A), with the hooked tip latches 714, 724 retaining the V-shaped module contacts 856, 857, 866, 867. At the instant the contact points pass over the latch tips, the contacts 856, 857, 866, 867 and latches 714, 724 (FIG. 7A) quickly return to their unflexed positions with a mechanical action that is referred to herein as a snap, snapping or snap-in. A similar mechanical action occurs when the contacts 856, 857, 866, 867 and latches 714, 724 (FIG. 7A) are disconnected and is referred to herein as an unsnap, unsnapping or snap-out.

The snapping and unsnapping of the outlet module during installation and removal creates positive tactile feedback that both a mechanical and electrical connection has been made between the outlet module 800 (FIGS. 8A-B) and the wiring panel 700 (FIGS. 7A-B). This is in contrast to a plug-in electrical connection, such as when the prongs of a standard AC plug are inserted into or removed from a standard socket, where the tactile feedback is that of slight, continual resistance to the movement of the plug rather than the build-up and quick release of resistance for the snap-in module installation into the module compartment 400 (FIG. 4C) and attached to the wiring panel 700 (FIGS. 7A-B) or the corresponding snap-out module removal according to the present invention.

Wiring Panel Outlet Module Wiring

In reference to FIG. 7B, the wiring panel 700 is wired for a full-hot duplex outlet by connecting the black, white and green wires of a single power cable to, for example, the first buss bottom cable connector 754, the second buss bottom cable connector 764, and ground buss cable connector 772, respectively. In this manner, both of the duplex sockets 811, 816 (FIG. 8A) of an installed outlet module 800 (FIGS. 8A-B) are always hot.

Also in reference to FIG. 7B, the wiring panel 700 is wired for a half-hot duplex outlet by connecting the black and white wires of one power cable as described above. The black and white wires of a second power cable are connected to the top hot 752 and neutral 762 connectors, respectively. Break away portions 755, 765 of the hot buss 750 and neutral buss 760, respectively, are removed, isolating the top hot connector 752 from the bottom hot connector 754 and the top neutral connector 762 from the bottom neutral connector 764. This also isolates the top panel contacts 756, 766 (FIG. 7A) from the bottom panel contacts 757, 767 (FIG. 7A). In this manner, one of the duplex sockets 816 (FIG. 8A) of an installed outlet module 800 is always hot and the other duplex socket 811 (FIG. 8A) is on or off, as controlled by a nearby switch that routes power to the second power cable.

Switch Module

FIGS. 9A-F illustrate a switch module 900, which has a front cover 902, a rocker switch 910, an attachment assembly 820, a back cover 904 and internal conductors 906. FIGS. 9A-B illustrate an assembled switch module 900, FIG. 9C illustrates the back of a switch module front cover 902, FIG. 9D illustrates the front of a switch module back cover 904, and FIGS. 9E-F illustrate the switch module internal conductors 906. As shown in FIG. 9A, the front cover 902 and back cover 904 are glued, welded or otherwise attached together to form the body of the switch module 900. The attachment assembly 820 is retained by the front cover 802, as described with respect to FIG. 8C, above, and provides the means to secure the switch module 900 to

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an electrical box 600 (FIGS. 6A-B). The front cover 902 incorporates a rocker switch 910, which has an upper portion 912 with a raised button 913 and a lower portion 914 with an indented button 915. The rocker switch 910 has a first position with the upper portion 912 proximate the front cover 902, as shown, and a second position with the lower portion 914 proximate the front cover 902.

As shown in FIG. 9B, the back cover 904 includes a top module fixture 930 and a bottom module fixture 940. The top module fixture 930 includes top contact housings 932 and top slots 934. The bottom module fixture 940 includes bottom contact housings 942, bottom slots 944, and a wiring panel key 946. The top contact housings 932 contain top module contacts 956, 966, and the bottom contact housings 942 contain bottom module contacts 957, 967. A ground bar 976 extends from the back cover 904 between the top contact housings 932.

As shown in FIG. 9C, the front cover 902 has a binding post 984 that press-fits into a corresponding binding socket 994 (FIG. 9D) on the back cover 904 (FIG. 9D) and binding sockets 983 that accept back cover binding posts 993, all for joining the front cover 902 and back cover 904 (FIG. 9D). The front cover 902 also has a switch aperture 981 through which protrudes a lever portion 918 of the rocker switch 910. The sides of the front cover 902 include protruding cover catches 903 that extend through bracket slots 823 (FIG. 8C) to retain the attachment assembly 820 (FIGS. 9A-B) and to retain a cover plate 1000 (FIGS. 10A-D), in a manner similar to that described with respect to FIG. 8C, above.

As shown in FIG. 9D, the back cover 904 has top recessed portions 991 within the top contact housings 932 that retain the top module contacts 956, 966 (FIGS. 9E-F). Similarly, the back cover 904 has bottom recessed portions 992 within the bottom contact housings 942 that retain the bottom module contacts 957, 967 (FIGS. 9E-F). The back cover 904 also has carrier supports 998 for the carrier 960 (FIGS. 9E-F), a buss support 997 for the second bottom buss 962 (FIGS. 9E-F), a support 996 for the top upper throw contact 967 (FIGS. 9E-F), as well as other raised structures (not shown) for supporting the first bottom buss 952 (FIGS. 9E-F) and the first top buss 951 (FIGS. 9E-F). A spring aperture 999 retains the slide spring 925 (FIG. 9E).

As shown in FIGS. 9E-F, the switch module internal conductors 906 include a first top buss 951, a second top buss 961, a first bottom buss 952 and a second bottom buss 962. The first top buss 951 electrically connects the first top module contact 956 and the top pole 954. The first bottom buss 952 electrically connects the first bottom module contact 957 and the bottom pole 955. The second top buss 961 electrically connects the second top module contact 966 and the carrier 960. The carrier 960 has a top lower throw contact 964 and a bottom upper throw contact 968. The second bottom buss 962 electrically connects the second bottom module contact 967 and the bottom lower throw contact 965. A center buss 963 electrically connects the top upper throw contact 967 and the bottom lower throw contact 965.

Also shown in FIGS. 9E-F, a slide 920 has a switch lever aperture 921, top stops 926 and bottom stops 927. The rocker switch lever 918 (FIG. 9C) fits into the lever aperture 921. The spring 925 provides resistance to movement of the slide 920 and a corresponding tactile tension to the rocker switch 910 (FIG. 9A). When the rocker switch 910 (FIG. 9A) is in its first position (as shown in FIG. 9A, the lever 918 (FIG. 9C) is in its down position (as shown in FIG. 9C), which moves the slide 920 in its down position. When the

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rocker switch 910 (FIG. 9A) is in its second position, the lever 918 (FIG. 9C) is in its up position, which moves the slide 920 to its up position (as shown in FIGS. 9E-F). In the slide upper position, the lower portions of the stops 926, 927 move the poles 954, 955 so as to connect with the upper throw contacts 967, 968. In the slide lower position, the upper portions of the stops 926, 927 move the poles 954, 955 so as to connect with the lower throw contacts 964, 965.

Switch Module Installation

In reference to FIG. 9B, a switch module 900 is installed in an electrical box 600 (FIGS. 6A-B) as described with respect to FIGS. 4D and F, above. A switch module 900 and the wiring panel 700 (FIGS. 7A-B) are keyed to prevent the installation of a switch module 900 into a module compartment 400 (FIG. 4D) with an incorrect, i.e. upside-down orientation. Specifically, the module key 946 must engage the bottom panel fixture 720 (FIG. 7A) and the ground bar 976 must engage the ground connector 718 (FIG. 7A) for proper module orientation. The module key 946 will not engage the top panel fixture 710 (FIG. 7A) and the ground bar 976 will not engage the bottom panel fixture 720 (FIG. 7A) in the improper orientation. That is, the module key 946 and ground bar 976 function as keyed structures of the switch module 900, and the ground connector 718 (FIG. 7A) and bottom panel fixture 720 (FIG. 7A), function as keyed structures of the wiring panel 700 (FIG. 7A), as described with respect to the outlet module 800 (FIGS. 8A-B), above. The keyed structures of the switch module 900 and the corresponding keyed structures of the wiring panel 700 (FIG. 7A) insure proper orientation of the installed switch module 900.

In reference to FIGS. 9E-F, when a switch module 900 (FIGS. 9A-B) is attached to a wiring panel 700 (FIGS. 7A-B), the first top module contact 956 is electrically connected to the first top panel contact 756 (FIGS. 7E-F), the second top module contact 966 is electrically connected to the second top panel contact 766 (FIGS. 7E-F), the first bottom module contact 957 is electrically connected to the first bottom panel contact 757 (FIG. 7E-F), and the second bottom module contact 967 is electrically connected to the second bottom panel contact 767 (FIGS. 7E-F).

Also in reference to FIGS. 9E-F, the switch module contacts 956, 957, 966, 967 are spring contacts and each having a generally V-shaped contact point. During installation, as the switch module 800 (FIGS. 8A-B) is pressed against the wiring panel 700 (FIGS. 7A-B) the top and bottom module contacts 956, 957, 966, 967 press against the corresponding top latches 714 (FIG. 7A) and bottom latches 724 (FIG. 7A) and eventually snap together, in a manner similar to that described with respect to the outlet module 800 (FIGS. 8A-B), above. The snapping and unsnapping of the switch module during installation and removal creates positive tactile feedback that both a mechanical and electrical connection has been made between the switch module 900 (FIGS. 9A-B) and the wiring panel 700 (FIGS. 7A-B) within the module compartment 400 (FIG. 4D).

Switch Module Configurations and Associated Wiring Panel Wiring

SPST Switch

As shown in FIGS. 9E-F, the internal conductors 906 can be configured as a SPST (single-pole, single-throw) switch, a DPST (double-pole, single-throw) switch, a three-way switch, and a four-way switch. If the top upper throw contact 967, the lower throw contact 964 and the bottom upper throw contact 968 are removed, the lower pole 955 and bottom lower throw contact 965 form a SPST switch. When

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the rocker switch 910 (FIG. 9A) is moved to its first position, causing the slide 920 to move to its lower position, the pole 955 connects with the bottom lower throw contact 965, electrically connecting the first bottom module contact 957 with the second bottom module contact 967. Likewise, when the rocker switch 910 (FIG. 9A) is moved to its second position, causing the slide 920 to move to its upper position, the pole 955 disconnects from the bottom lower throw contact 965, electrically disconnecting the first bottom module contact 957 with the second bottom module contact 967. Thus, movement of the rocker switch 910 (FIG. 9A) between its first and second positions alternately makes and breaks an electrical connection between the bottom module contacts 957, 967.

In reference to FIG. 7B, the wiring panel 700 is wired for a SPST switch, as described above, by connecting the black (hot) wire of a first power cable to the first buss bottom cable connector 754 and the black wire of a second power cable to the second buss bottom cable connector 764. In this manner, when the first bottom module contact 757 is switched to the second bottom module contact 767 via an installed SPST switch module 900 (FIGS. 9A-B), as described with respect to FIGS. 9E-F, above, power is switched between the first and second power cables.

DPST Switch

As shown in FIGS. 9E-F, if the top upper throw contact 967 and the bottom upper throw contact 968 are removed, the upper pole 954 in conjunction with the top lower throw contact 964 and the lower pole 955 in conjunction with the bottom lower throw contact 965 form a DPST switch. When the rocker switch 910 (FIG. 9A) is moved to its first position, causing the slide 920 to move to its lower position, the poles 954, 955 connect with the corresponding lower throw contacts 964, 965 electrically connecting the top module contacts 956, 966 and, also, electrically connecting the bottom module contacts 957, 967. Likewise, when the rocker switch 910 (FIG. 9A) is moved to its second position, causing the slide 920 to move to its upper position, the poles 954, 955 disconnect with the corresponding lower throw contacts 964, 965 electrically disconnecting the top module contacts 956, 966 and, also, electrically disconnecting the bottom module contacts 957, 967. Thus, movement of the rocker switch 910 (FIG. 9A) between its first and second positions alternately makes and breaks an electrical connection between the top module contacts 956, 966 and, also, alternately makes and breaks an electrical connection between the bottom module contacts 957, 967.

In reference to FIG. 7B, the wiring panel 700 is wired for a DPST switch, as described above, by removing the first 755 and second 765 buss breakaways to isolate the top panel contacts 756, 766 (FIGS. 7E-F) from the bottom panel contacts 757, 767 (FIGS. 7E-F) and, hence, isolating the top module contacts 956, 966 (FIGS. 9E-F) from the bottom module contacts 957, 967 (FIGS. 9E-F) of an installed DPST switch module. The black and white wires of a first power cable are connected to the first buss bottom 754 and top 752 cable connectors, respectively. The black and white wires of a second power cable are connected to the second buss bottom 764 and top 762 cable connectors, respectively. In this manner, when the first top panel contact 756 is switched to the second top panel contact 766 and the first bottom panel contact 757 is switched to the second bottom panel contact 767 via an installed DPST switch module 900 (FIGS. 9A-B), as described with respect to FIGS. 9E-F, above, an electrical load can be switched between the first and second power cables.

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Three-Way Switch

As shown in FIGS. 9E-F, if the top upper throw contact 967 is removed, the upper pole 954 in conjunction with the top lower throw contact 964 and the lower pole 955 in conjunction with the bottom lower and upper throw contacts 965, 968 form a three-way switch. When the rocker switch 910 (FIG. 9A) is moved to its first position, causing the slide 920 to move to its lower position, the poles 954, 955 connect with the corresponding lower throw contacts 964, 965 electrically connecting the top module contacts 956, 966 and, also, electrically connecting the bottom module contacts 957, 967. When the rocker switch 910 (FIG. 9A) is moved to its second position, causing the slide 920 to move to its upper position, the top pole 954 is disconnected. The bottom pole 955, however, is connected with the bottom upper throw contact 968, which is connected to the second top module contact 966 via the carrier 960 and the second top buss 961. Thus, movement of the rocker switch 910 (FIG. 9A) between its first and second positions alternately makes and breaks an electrical connection between the bottom module contacts 957, 967 and, also, electrically connects the second top module contact 966, alternately, with the first top module contact 956 and the first bottom module contact 957.

Four-Way Switch

As shown in FIGS. 9E-F, if all of the conductors 906 are in place, the upper pole 954 in conjunction with the top lower and upper throw contacts 964, 967 and the lower pole 955 in conjunction with the bottom lower and upper throw contacts 965, 968 form a four-way switch. When the rocker switch 910 (FIG. 9A) is moved to its first position, causing the slide 920 to move to its lower position, the poles 954, 955 connect with the corresponding lower throw contacts 964, 965 electrically connecting the top module contacts 956, 966 and, also, electrically connecting the bottom module contacts 957, 967. When the rocker switch 910 (FIG. 9A) is moved to its second position, causing the slide 920 to move to its upper position, the poles 954, 955 connect with the corresponding upper throw contacts 967, 968, electrically connecting the top first module contact 956 with the bottom second module contact 967 via the center buss 963 and, also, electrically connecting the bottom first module contact 957 with the top second module contact 966 via the carrier 960 and the second top buss 961. Thus, movement of the rocker switch 910 (FIG. 9A) between its first and second positions makes an electrical connection between the bottom module contacts 957, 967 and, also, between the top module contacts 956, 966, and, alternately, makes an electrical connection between the first top module contact 956 and the second bottom module contact 967 and, also, between the first bottom module contact 957 and the second top module contact 966.

The outlet module 800 (FIGS. 8A-B) and switch module 900 (FIGS. 9A-B) are described above as having top and bottom contacts at the back side of the back covers 804 (FIG. 8B), 904 (FIG. 9B), with corresponding contact placement on the wiring panel front side 702 (FIGS. 7A-B). Other contact placements are contemplated as being within the scope of the present invention. For example, one of ordinary skill in the art will recognize that side contacts along the back side of the back covers or contacts along the edges or sides of the module covers also would be feasible. Further, the modules 800 (FIGS. 8A-B), 900 (FIGS. 9A-B) are described above as having spring contacts, with corresponding latches and contact surfaces located on the wiring panel 700 (FIGS. 7A-B). Other contact types and combinations are contemplated as being within the scope of the present invention. For example, contact surfaces and latches

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mounted in the modules 800 (FIGS. 8A-B), 900 (FIGS. 9A-B), with corresponding spring contacts mounted in the wiring panel 700 (FIGS. 7A-B) are also feasible.

Face Plates

FIGS. 10A-D illustrate a face plate 1000, which provides the wall trim for an installed electrical outlet 310 or switch 360, as described with respect to FIG. 2, above. As shown in FIGS. 10A-B, one embodiment of a face plate 1000 has a flared-rectangular-shaped cover plate 1010 and a cover aperture 1020. In another embodiment, the face plate 1000 has a rectangular-shaped cover plate 1080 (FIG. 10C). In yet another embodiment, the face plate 1000 has an oval-shaped cover plate 1090 (FIG. 10D). The cover plate 1010 has a front side 1012, which is the visible trim when installed, and a back side 1014, which is not visible when installed flush against a wall. The cover aperture 1020 has straight edges and semi-circular ends and fits over the similarly shaped raised portion 810 (FIG. 8A) of an outlet module 800 (FIGS. 8A-B) or the similarly shaped rocker switch 910 (FIG. 9A) of a switch module 900 (FIGS. 9A-B).

As shown in FIG. 10B, the face plate 1000 is installed onto and removed from an installed module 800 (FIGS. 8A-B), 900 (FIGS. 9A-B) without the use of separate fasteners, such as conventional screws. The plate back side 1014 has protruding tabs 1030, each with an indented portion 1032 that latch onto an outlet module catch 803 (FIG. 8D) or switch module catch 903 (FIG. 9C). The tabs 1030 releasably retain the face plate 1000 when pressed onto an installed outlet module 800 (FIGS. 8A-B) or switch module 900 (FIGS. 9A-B). In this manner, the face plate 1000 covers the wall-mounted electrical box 600 (FIGS. 6A-B) and the modules installed therein.

Protective Cover

FIGS. 11A-B illustrate a protective cover 1100, which protects the interior of the electrical box 600 (FIGS. 6A-B), the wiring panel 700 (FIGS. 7A-B), and the associated power cables installed within the electrical box 600 (FIGS. 6A-B) during the makeup phase, as described with respect to FIG. 14B, below. The protective cover 1100 has a shield plate 1110, a top sleeve 1120 and a bottom sleeve 1130. The shield plate 1110 is generally planar and dimensioned to closely conform to the interior of the electrical box 600 (FIG. 6A) and the wiring panel front side 702 (FIG. 7A). The top sleeve 1120 extends perpendicularly from the shield plate 1110 so that the top sleeve inside 1122 fits over the top panel fixture 710. The bottom sleeve 1130 also extends perpendicularly from the shield plate 1110 so that the bottom sleeve inside 1132 fits over the bottom panel fixture 720. The shield plate has post slots 1140, cutouts 1150, mounting holes 1160, and a plug opening 1170. The post slots 1140 allow the protective cover 1100 to slide over the module mounting posts 622 (FIG. 6B) during installation in the electrical box 600 (FIGS. 6A-B). The cutouts 1150 and the mounting holes 1160 work in conjunction to allow the protective cover 1100 to be easily secured to and removed from the wiring panel 700 (FIGS. 7A-B) without unfastening the wiring panel 700 (FIGS. 7A-B) from the electrical box 600 (FIGS. 6A-B), as described with respect to FIG. 12, below. The plug opening 1170 allows a standard AC plug to access the wiring panel socket 730 when the protective cover is in place, as described with respect to FIG. 14B, below.

Protective Cover Installation

FIG. 12 illustrates a protective cover 1100 during installation over a wiring panel 700. The protective cover 1100 is installed in the interior of the electrical box 600 (FIGS. 6A-B) and positioned so as to shield the exposed front side

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702 of the wiring panel 700, as described with respect to FIG. 14B, below. The fasteners 707 corresponding to the mounting holes 1160 are removed from the wiring panel 700. The fasteners 707 corresponding to the cutouts 1150 are not removed during installation or removal of the protective cover 1100, allowing the wiring panel 700 to remain secured inside the electrical box (not shown). As shown in FIG. 12, the protective cover 1100 is positioned within the electrical box (not shown) adjacent the wiring panel 700 so that the protective cover front side 1112 is away from the wiring panel front side 730 and the protective cover plug opening 1170 aligns with the wiring panel socket 730. In this position, the protective cover 1100 is simply pressed against the wiring panel 700 so that the top panel fixture 710 fits within the top sleeve 1120, the bottom panel fixture 720 fits within the bottom sleeve 1130 and the cutouts 1150 fit around the remaining fasteners 707. The protective sleeve 1100 then may be secured to the wiring panel 700 with the removed fasteners 707 threaded through the protective cover mounting holes 1160, the wiring panel mounting holes 708 (FIG. 7C) and the electrical box panel mounting posts 620 (FIGS. 6A-B). Removal of the protective cover 1100 from the wiring panel 700 prior to module installation simply proceeds in the reverse of the above-described steps. The top sleeve 1120 and bottom sleeve 1130 provide a gripping surface for removing the protective sleeve 1100.

Box Mount and Electrical Box Installation

FIGS. 13A-C illustrate an electrical box 600 mounted on a box mount 500. The electrical box 600 is typically mounted after the box mount 500 is installed on a wall stud, as described with respect to FIG. 14A, below. FIG. 13A illustrates the installation of the electrical box 600 on the box mount 700 and illustrates the releasable latch 650 within the electrical box 600 used to lock the electrical box 600 in a fixed position relative to the box mount 500 and, correspondingly, release the electrical box 600 so that it can be moved to another fixed position. FIGS. 13B-C illustrate the various fixed positions of the electrical box 600.

As shown in FIG. 13A, the electrical box 600 is mounted so that the slides 630 are movably retained within the mounting brackets 530 and the guides 640 are moveable within box mount grooves 540 (FIGS. 6A-B). The releasable latch 650 has a tab portion 654 (FIGS. 6A-B) that fits within box mount catch slots 560 (FIGS. 13B-C) to lock the electrical box 600 at various fixed positions. The latch 650 is released and the electrical box 600 moved to different positions by inserting a screwdriver tip or similar tool into a latch release portion 1310. The screwdriver is then twisted so that the screwdriver tip pushes the release portion 1310 away from the electrical box wall, temporarily lifting the tab portion 654 from a catch slot 560 (FIGS. 13B-C). With the latch 650 released, the electrical box 600 can be repositioned along the box mount 500 or removed from the box mount 500 utilizing the finger grip 670 to pull or push the electrical box 600 along the mounting brackets 530.

As shown in FIGS. 13B-C, the electrical box 600 can be releasably locked in any one of several fixed positions. Each of these fixed positions locates the front face 602 a specific distance from the box mount leading edge 502. The box mount 500 is installed on a wall stud, and the leading edge 502 functions as an alignment guide along an edge of the wall stud, as described with respect to FIG. 14A, below. The tab portion 654 of the electrical box latch 650 (FIG. 13A), releasably engages any one of several catch slots 560, which are located at measured positions along the box mount 500. In this manner, the electrical box 600 is positioned so that its open front face 602 is flush with an installed wall panel,

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advantageously accommodating various wall panel thicknesses. Position indicators 660 align with the leading edge 502 to visibly indicate the distance from the leading edge 502 to the open face 602 associated with the various catch slots 560 and, hence, the various fixed positions of the electrical box 600.

As shown in FIG. 13B, the electrical box 600 is locked in a first position. A particular catch slot 1324 retains the latch tab portion 654, and a corresponding position indicator 1322 aligns with the leading edge 502, visibly indicating 1.25 inches. Thus, the electrical box front face 602 extends from the box mount leading edge 502 and, hence, a wall stud edge, by 1.25 inches.

As shown in FIG. 13C, the electrical box 600 is locked in a second position. A particular catch slot 1334 retains the latch tab portion 654, and a corresponding position indicator 1332 aligns with the leading edge 502, visibly indicating 1.75 inches. Thus, the electrical box front face 602 extends from the box mount leading edge 502 and, hence, a wall stud, by 1.75 inches. In a particular embodiment, the electrical box front face 602 can be extended from the box mount leading edge 502, and hence a wall stud edge, at specific distances in the range of between 0.5 inches and 1.75 inches. In another particular embodiment, the electrical box front-face 602 can be extended from the box mount leading edge 502, and hence a wall stud edge, at specific distances of 0.5, 0.625, 1.25 and 1.75 inches.

The electrical box 600 is described above as having a latch with a tab portion that engages catch slots located along the box mount 500. Other mechanisms for locking the electrical box 600 at various fixed positions relative to the box mount 500 are also contemplated as within the scope of the present invention. For example, the electrical box 600 could have various catch slots, with a latch located on the box mount 500. The catch slots could be any shaped aperture, which is engaged with a correspondingly shaped tab portion of the latch.

The box mount 500 is described above as having a leading edge that functions as an alignment guide. Other features of the box mount could also function as an alignment guide within the scope of the present invention. For example, a feature, such as an arrow or similar indicator could be molded or otherwise attached to the box mount and used as an alignment guide.

Installation at Rough Framing Phase

FIGS. 14A-B illustrate a mounted electrical box and associated components installed on a wall stud. FIG. 14A illustrates a partial electrical box assembly 1400 including a box mount 500 attached to a wall stud 1402, a mounted electrical box 600 and an installed wiring panel 700. FIG. 14B illustrates a shielded partial electrical box assembly 1460 including a protective cover 1100 installed over the wiring panel 700 (FIG. 14A) of the partial electrical box assembly 1400 (FIG. 14A).

As shown in FIG. 14A, the box mount 500 is attached to a wall stud 1402 by aligning the box mount leading edge 502 as a guide along the stud's wall-facing edge 1404 and hammering in the fasteners 522, which can be staples, nails or similar devices. The electrical box 600 is then attached to the box mount 500, as described with respect to FIG. 13A, above. This alignment in conjunction with the box mount fixed positions 560 (FIGS. 13B-C) provides a specific distance from the wall stud to the electrical box opening 602, allowing the electrical box to be installed flush with a wall panel finished exterior surface, i.e. the surface typically painted during the makeup phase, as described with respect to FIGS. 13B-C, above.

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Also shown in FIG. 14A is an installed wiring panel 700. The wiring panel 700 is installed within the electrical box 600 by positioning the wiring panel 700 at the box open front 602 so that the mounting post slots 706 fit over the mounting posts 620. The wiring panel 700 is then inserted into the electrical box 600 until the wiring panel back side 704 (FIG. 7B) abuts the panel mounting posts 610 (FIGS. 6A-B). The wiring panel 700 is secured within the electrical box 600 against the panel mounting posts 610 (FIGS. 6A-B) by inserting fasteners 707, which are screws or equivalent devices, through the mounting holes 708 (FIGS. 7A-B) and into the panel mounting post centered holes 612 (FIGS. 6A-B). The grips 709 are used to manually grasp and position the wiring panel 700 during installation. One grip 709 also allows access to the electrical box latch 650 (FIG. 13A), for positioning the electrical box after installation of the wiring panel 700.

FIG. 14A shows the partial electrical box assembly 1400 as it would appear in the rough phase or during replacement of a defective module. The wiring panel 700 partitions the electrical box interior into a user accessible module compartment 400 between the front face 602 and the wiring panel front side 702 and a user inaccessible wiring compartment (not visible) between the back face 604 (FIG. 6B) and the wiring panel back side 704 (FIG. 7B). The term user accessibility as used herein is understood to mean access without removal of the wiring panel 700. The module compartment 400 is dimensioned for installation of an outlet module 800 (FIGS. 8A-B), switch module 900 (FIGS. 9A-B) or similar module, such as a dimmer switch. The wiring compartment contains cable connectors for installation of power cables by a journeyman electrician.

As shown in FIG. 14A, the partitioning of the electrical box interior advantageously allows access only to the module compartment 400, which is physically separated from the exposed wiring of the power cables within the wiring compartment (not visible). There is no access to the building electrical wiring without physical removal of the wiring panel 700, preserving the integrity of the electrical wiring from third-party tampering and protecting third-parties from the shock hazard of exposed high voltage conductors. Further, there are no external parts to interfere with wall panel installation, and there are no exposed cables within the module compartment 400 susceptible to fouling or damage during the makeup building phase. Access to the module compartment, however, which has shielded, snap-in contacts, as described with respect to FIG. 7B, above, allows easy and comparatively safe installation or replacement of modules by unskilled personnel.

Prior to module installation, which would typically occur after the makeup phase is complete, a socket 730 is available for accepting a standard AC plug, providing electrical power at the construction site after verification that the wiring panel 700 is properly wired. Punch-outs or other panel markings (not shown) indicate how the panel 700 is wired, such as fall hot, half hot, SPST switch, DPST switch, 3-way switch, 4-way switch as described with respect to FIGS. 15-16, below.

As shown in FIG. 14B, the protective cover 1100 shields the interior of the electrical box 600 and, in particular, the exposed front side of the wiring panel 700 (FIG. 14A). In this manner, the electrical box 600 and wiring panel 700 (FIG. 14A) are advantageously protected from drywall compound, paints and other materials used during wall panel installation. Prior art wiring assemblies, during this makeup phase, have exposed power cables simply coiled up and pushed into bare electrical boxes, exposing the wires to

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fouling and damage from routers used during wall panel installation, as described above. On the other hand, nothing is exposed to fouling or damage in the partial wiring assembly 1460 of the present invention. After the makeup phase is complete, the shield 1100 can be easily removed, as described with respect to FIG. 12, above. The protective cover 1100 has a plug opening 1170 (FIG. 11) corresponding to the wiring panel socket 730 (FIG. 14A), allowing a standard AC plug 1490 to be inserted through the protective cover 1100 and into the socket 730 (FIG. 14A) for access to electrical power without removal of the protective cover 1100, e.g. during the makeup phase.

Adapter Wiring Panel

FIG. 15 illustrates an adapter wiring panel 1500, which has a wiring panel 700 (FIGS. 7A-B) modified with adapter brackets 1510. The adapter brackets 1510 each have a post 1520, an end piece 1530 and a clip 1540. The post 1520 is fixedly attached to the board 701, extending perpendicularly away from the front face 702. The end piece 1530 is attached to the end of the post 1520 distal the board 701. The clip 1540 is attached to the end piece 1530 perpendicularly to the post 1520. Mounting holes 1532 are provided in each end piece 1530. The adapter wiring panel 1500 is installed within a standard electrical box 100 (FIG. 1) with the clips 1540 attached along the top and bottom box edges and secured with screws 130 (FIG. 1) or equivalent fasteners inserted through the mounting holes 1532 and into the mounting posts at the top and bottom of the electrical box 100 (FIG. 1). In this manner, a standard electrical box 100 (FIG. 1) can be converted to a safety electrical outlet and switch system that accepts snap-in outlet and switch modules according to the present invention. Conveniently, the adapter board can be installed in lieu of a wiring panel 700 (FIGS. 7A-B) in the electrical box 600 (FIGS. 6A-B) utilizing the clips 1540 rather than securing a wiring panel 700 (FIGS. 7A-B) with fasteners 707 (FIG. 7C).

The safety electrical outlet and switch system has been disclosed in detail in connection with various embodiments of the present invention. These embodiments are disclosed by way of examples only and are not to limit the scope of the present invention, which is defined by the claims that follow. One of ordinary skill in the art will appreciate many variations and modifications within the scope of this invention.

What is claimed is:

1. An electrical wiring assembly comprising:

an electrical box having an open front face and a back face defining a power cable aperture;

a generally planar wiring panel having a front side and a back side, said front side having a panel fixture extending perpendicularly from said front side and a shielded contact surface within said fixture, said back side having a cable connector, said panel having a bus electrically connecting said cable connector to said contact surface, said wiring panel installable within said box so as to create a module compartment in the interior of said box between said front side and said open front face; and

an electrical module comprising a front cover and a back cover, said front cover providing a user accessible electrical function, said back cover having a module fixture and a shielded spring contact within said module fixture, said module fixture configured to engage said panel fixture so as to connect said spring contact with said contact surface;

said module having an installed position inserted into said electrical box within said module compartment and an uninstalled position removed from said electrical box,

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said module being removably retained by said panel in said installed position so that power cabling routed through said aperture into said electrical box and connected to said cable connector provides power to said module via said bus, said contact surface, and said spring contact.

2. The electrical wiring assembly of claim 1 further comprising a box mount configured to fixedly attach to a wall stud utilizing a stud alignment guide, said electrical box attachable to said box mount and movable between a plurality of latchable positions relative to said alignment guide so as to accommodate various wall panel thicknesses.

3. The electrical wiring assembly of claim 1 wherein said wiring panel has a socket providing access to electrical power when power cabling is attached to said cable connector, said electrical wiring assembly further comprising a protective cover installable over said wiring panel front side and having plug openings so as to allow plug access to said wiring panel socket.

4. The electrical wiring assembly of claim 1 further comprising a face plate having a protruding tab, said module having a corresponding catch so that said face plate removably snaps onto said module front cover when said module is in said installed position.

5. The electrical wiring assembly of claim 1 wherein said module further comprises an extractor handle, said handle having a closed position secured to said electrical box and an open position extending away from said module, said handle in said open position clamping said module and providing a grip to extract said module from said electrical box.

6. The electrical wiring assembly of claim 1 wherein said module further comprises a module keyed portion of said back cover, said module keyed portion corresponding to a wiring panel keyed portion, said module keyed portion and said wiring panel keyed portion insuring the proper orientation of said module in said installed position.

7. An electrical wiring assembly comprising:

an electrical box having an open front face and a back face defining a power cable aperture, said electrical box configured to be installed with said front face generally flush with a wall panel exterior surface;

a wiring panel comprising a generally planar board, said wiring panel fastened within said electrical box so as to partition the interior of said box into a user accessible module compartment proximate said front face and a user inaccessible wiring compartment proximate said back face,

said wiring panel having a fixture within said module compartment and a cable connector within said wiring compartment,

said fixture providing an electrical connection to said cable connector via a bus portion of said wiring panel, said cable connector configured to terminate a power cable routed through said aperture into said wiring compartment; and

a user replaceable module providing a user operable electrical function, said module installable within said module compartment by snapping said module into said fixture and removable from said module compartment by unsnapping said module from said fixture, said module electrically connected to said cable connector when installed within said module compartment.

8. The electrical wiring assembly of claim 7 wherein said fixture has a first contact and said module has a corresponding second contact, one of said first and second contacts having a latch and an associated contact surface and the

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other one of said first and second contacts having a spring contact, said spring contact being retained by said latch and electrically connecting to said contact surface when said module is snapped into said fixture.

9. The electrical wiring assembly of claim 8 wherein portions of said fixture shield said first contact on all sides so as to minimize user exposure to said first contact when said module is not installed within said module compartment.

10. The electrical wiring assembly of claim 7 further comprising:

a socket portion of said wiring panel configured to accept a standard AC plug inserted into said module compartment when said module is not installed; and

a corresponding plug contact portion of said wiring panel located within said wiring compartment, said plug contact connected said cable connector via said buss and configured to accept and electrically connect to a prong portion of said plug.

11. The electrical wiring assembly of claim 7 wherein said module has an extractor handle, said handle having a closed position generally flush with said module and an open position extended from said module so as to provide a grip, said module securable to said electrical box with said handle in said closed position and removable from said module compartment with said handle in said open position.

12. An electrical wiring assembly comprising:

an electrical box having an open front face and an internal mounting post located at a recess from said front face;

a wiring panel having a front side and a back side, said wiring panel installed inside said electrical box with said back side abutting said mounting post;

a cable connector located on said wiring panel back side configured to connect to a power cable;

a contact surface electrically connected to said cable connector;

a panel fixture located on said wiring panel front face and housing said contact surface;

a prong connector electrically connected to said cable connector; and

a socket located on said wiring panel front face and housing said prong connector, said cable connector configured to connect to a power cable so that power is transmitted to a plug inserted into said socket via said power cable, said cable connector and said prong connector.

13. The electrical wiring assembly of claim 12 further comprising a protective cover mounted over said wiring panel front side, said protective cover having a plug opening corresponding to said socket so that a plug inserted into said plug opening also is inserted into said socket.

14. The electrical wiring assembly of claim 12 further comprising a box mount attachable to a wall stud along an alignment guide, said box mount having a first catch at a first distance from said alignment guide and a second catch at a second distance from said alignment guide, said electrical box mounted to said box mount and slidable between a first latched position corresponding to said first catch and a second latched position corresponding to said second catch.

15. The electrical wiring assembly of claim 12 wherein said recess is at least about 1.25 inches so as to avoid damage to said wiring panel during wall panel installation.

16. An electrical box assembly comprising:

a box mount attachable to a wall stud in accordance with a stud alignment guide of said box mount;

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a plurality of catches located along said box mount; an electrical box having a front face, said box slidably attached to said box mount;

a latch portion of said box configured to releasably engage any of said catches,

said box having a plurality of fixed positions corresponding to said catches, each of said positions placing said front face at a specific distance from said alignment guide so that said electrical box can be adjusted for various wall panel thicknesses.

17. The electrical box assembly of claim 16 further comprising a plurality of position indicators located on said electrical box associated with said positions, each of said indicators displaying a corresponding distance from said alignment guide to said front face.

18. The electrical box assembly of claim 17 wherein said corresponding distance is in the range of 0.5 inches to 1.75 inches.

19. The electrical box assembly of claim 16 wherein said alignment guide is the leading edge of said box mount and each of said position indicators aligns with said leading edge to indicate the current distance between said front face and said leading edge.

20. The electrical box assembly of claim 16 further comprising a side of said electrical box defining a finger aperture, said aperture providing a grip to move said electrical box between said positions.

21. The electrical box assembly of claim 16 wherein said latch portion has a latch release portion configured to accept a tool to pry said latch from a particular one of said catches.

22. The electrical box assembly of claim 16 wherein said electrical box has a grip configured to accommodate a finger so as to facilitate the moving of said electrical box between said positions.

23. An electrical wiring assembly comprising:

an electrical box means for mounting in a wall;

a wiring panel means for attaching power cables, said wiring panel means installed within said electrical box means;

a module means for providing an electrical function installable within said electrical box means; and

a snapin means for removably attaching and electrically connecting said module means to said wiring panel means with tactile feedback.

24. The electrical wiring assembly of claim 23 further comprising a box mount means for attaching said electrical box to a wall stud.

25. The electrical wiring assembly of claim 23 further comprising a protective cover means for shielding said wiring panel during the makeup phase of building construction.

26. The electrical wiring assembly of claim 23 further comprising a face plate means for trimming said module when installed within said electrical box.

27. An electrical wiring assembly comprising:

an electrical box having an open front face and a back face;

a module compartment defined within said box proximate said front face;

a wiring compartment defined within said box proximate said back face;

a wiring panel separating said module compartment from said wiring compartment;

a plurality of first contacts mounted within said module compartment and configured to electrically connect with a replaceable module; and

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a plurality of second contacts mounted within said wiring compartment and configured to electrically connect with a power cable, said first contacts interconnected with corresponding ones of said second contacts.

28. The electrical wiring assembly of claim 27 further comprising a socket portion of said wiring panel having a hot slot, a neutral slot and a ground hole configured to accept a plug inserted into said module compartment when said module is not installed; and

a plurality of third contacts mounted within said socket portion and interconnected with corresponding ones of said second contacts.

29. The electrical wiring assembly of claim 28 further comprising a removable protective cover configured to install within said module compartment so as to shield said wiring panel.

30. The electrical wiring assembly of claim 27 further comprising a plug opening defined by said protective cover and corresponding to said socket portion so as to allow said plug to be inserted through said protective cover and into said socket.

31. An electrical wiring assembly comprising:

an electrical box having an open front face;

a wiring panel installable within said electrical box;

a cable connector located on a back side of said wiring panel and configured to electrically connect to a power cable;

a panel contact located on a front side of said wiring panel and configured to electrically connect to a removable module having a spring contact; and

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a socket contact located on said front side and configured to electrically connect to removable plug having a prong contact.

32. The electrical wiring assembly of claim 31 wherein said panel contact and said spring contact provide tactile feedback when connected.

33. The electrical wiring assembly of claim 31 wherein said wiring panel comprises:

a post attached to and extending perpendicularly, from said front side; and

a clip attached to said post distal said panel, said clip adapted to mount to an edge of said box so as to secure said panel within said box.

34. An electrical wiring assembly comprising:

an electrical box configured to house a power cable;

a wiring panel adapted to install within said box and to electrically connect to said power cable;

a keyed panel fixture located on said wiring panel;

a module adapted to electrically connect to said wiring panel so as to transfer power from said power cable; and

a keyed module fixture located on said module, said keyed panel fixture and said keyed module configured to engage so as to removably attach said module to said wiring panel only in a proper orientation.

35. The wiring assembly of claim 34 further comprising a ground bar configured to engage a ground connector in said proper orientation.

* * * * *



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(12) **United States Patent**
Gorman

(10) **Patent No.:** **US 7,052,313 B2**
(45) **Date of Patent:** **May 30, 2006**

(54) **ELECTRICAL DISTRIBUTION WIRING
MODULE**

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
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(21) Appl. No.: **11/110,351**

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(65) **Prior Publication Data**

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22, 2003, now Pat. No. 6,884,111.

(60) Provisional application No. 60/631,244, filed on Nov.
26, 2004, provisional application No. 60/441,852,
filed on Jan. 21, 2003, provisional application No.
60/383,269, filed on May 23, 2002.

(51) Int. Cl.
H01R 13/60 (2006.01)

(52) U.S. Cl. **439/535; 439/516; 439/441;**
439/107; 174/53

(58) Field of Classification Search **439/535;**
439/516, 441, 374, 215, 539, 107; 174/53,
174/57

See application file for complete search history.

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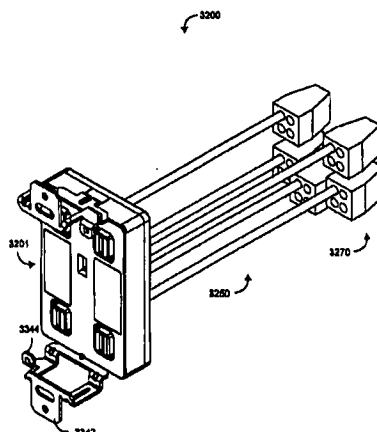
Primary Examiner—Gary F. Paumen

(74) *Attorney, Agent, or Firm*—Law Office of Glenn R.
Smith; Glenn R. Smith; Lei Liu

(57) **ABSTRACT**

A wiring module adapted to mount within an electrical box
has a functional side and an opposite wiring side. The
functional side has sockets adapted to removably connect
with a functional module. A terminal set provides a conduc-
tive portion of the sockets and is adapted to terminate a
power cable. A shield is disposed proximate the wiring side
so as to seal the terminal set.

14 Claims, 43 Drawing Sheets



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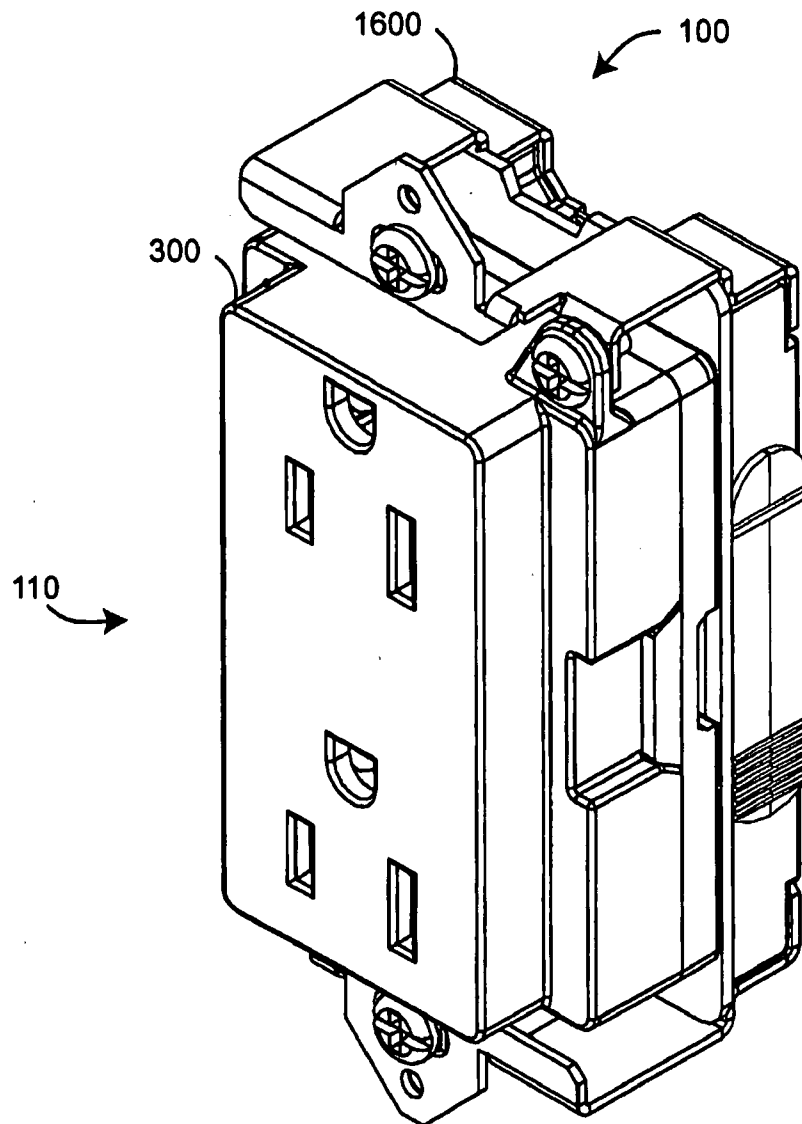


FIG. 1A

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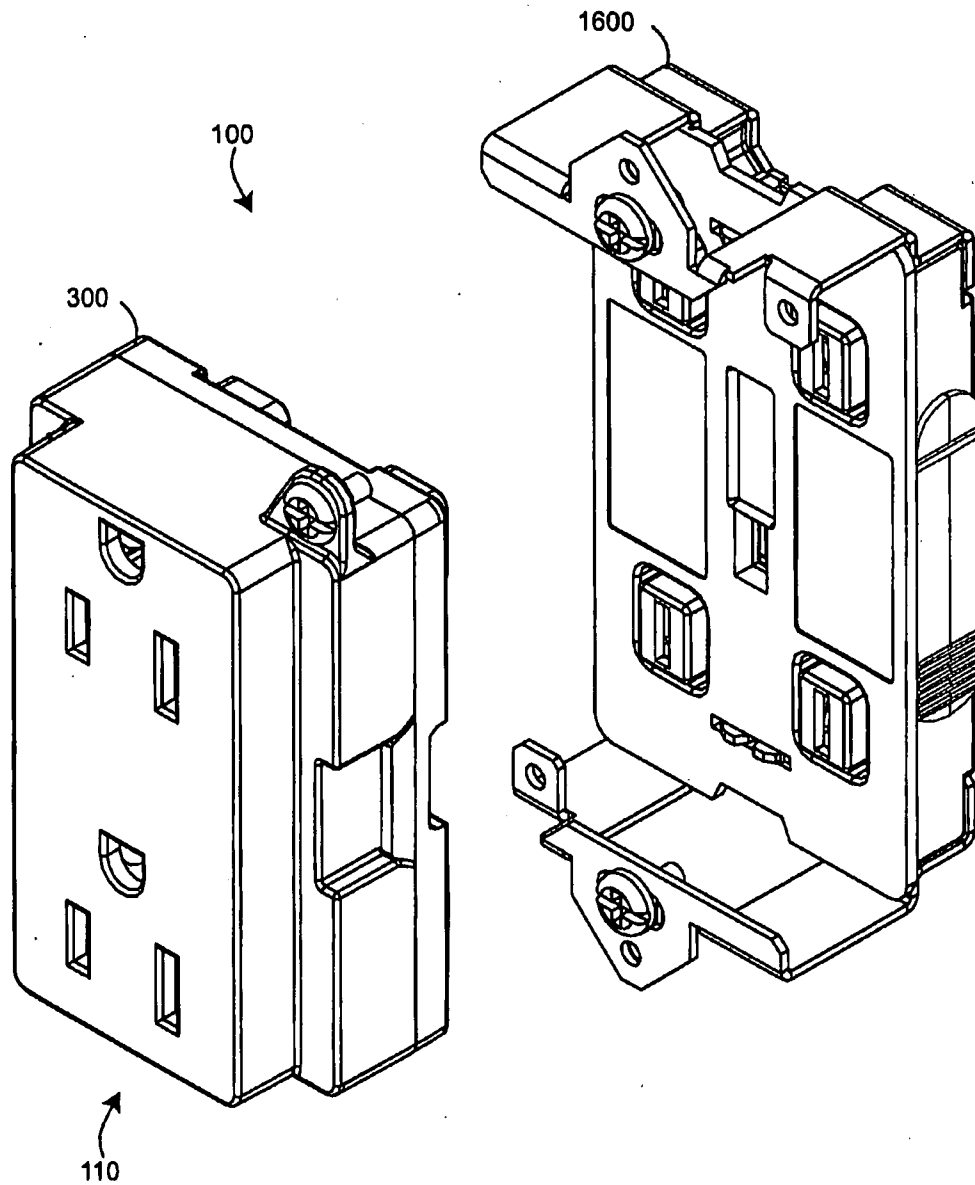


FIG. 1B

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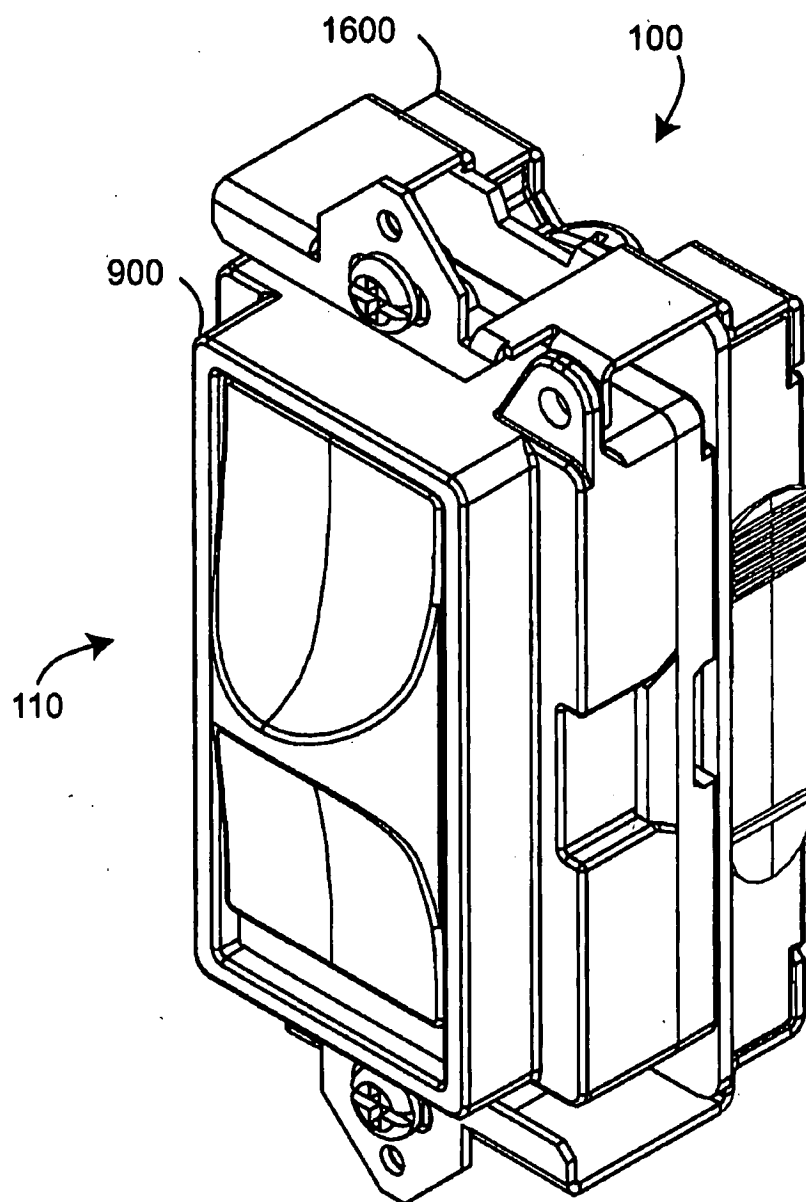


FIG. 2A

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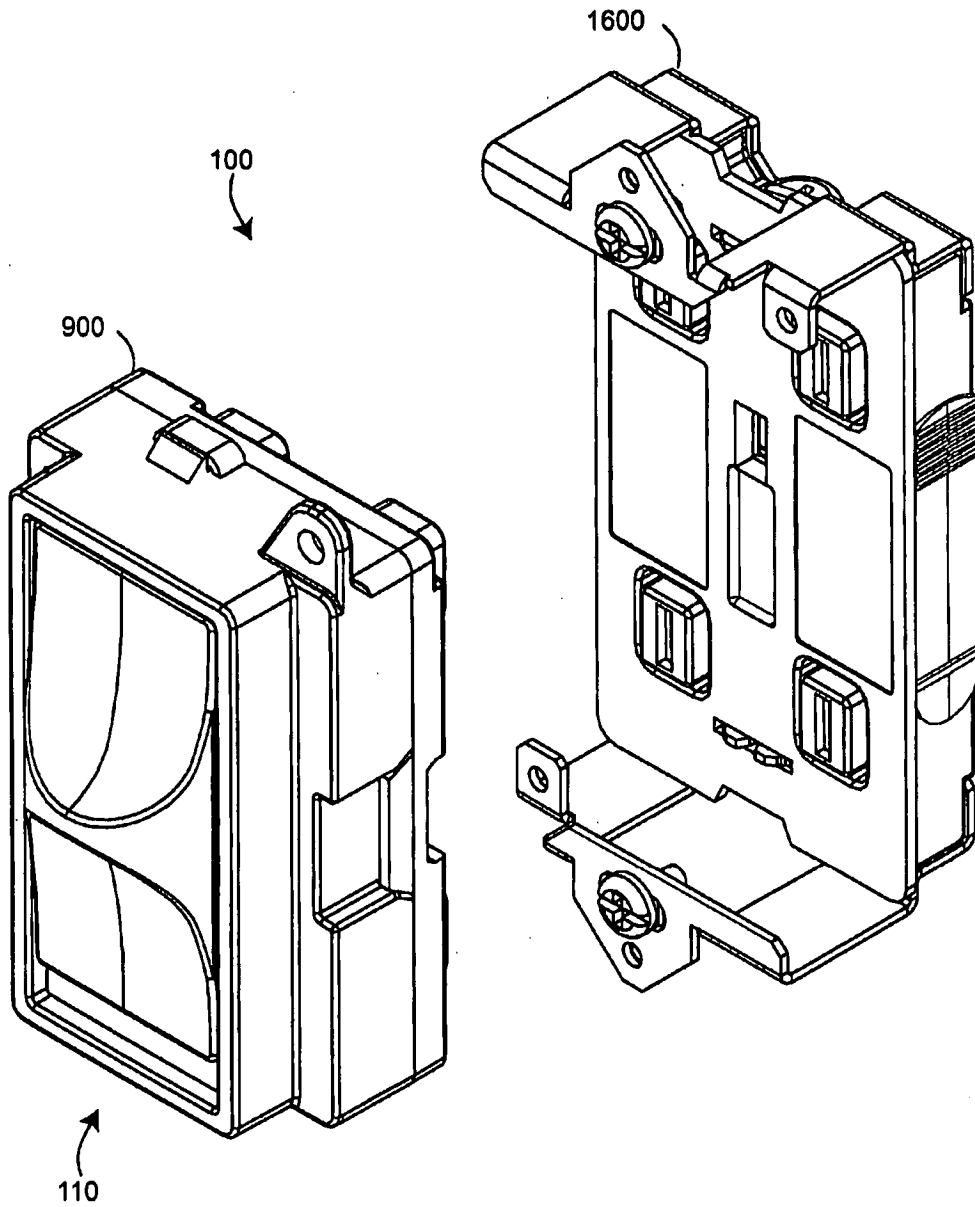


FIG. 2B

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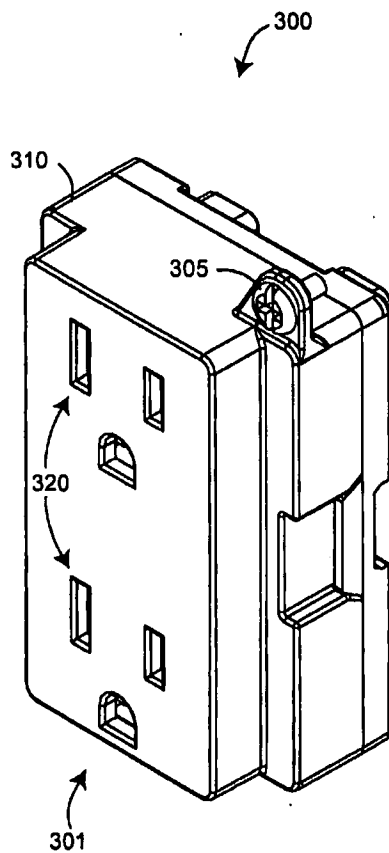


FIG. 3A

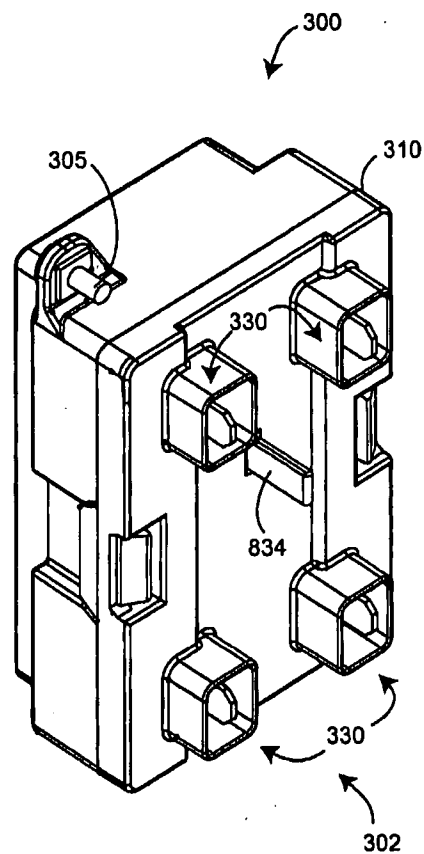


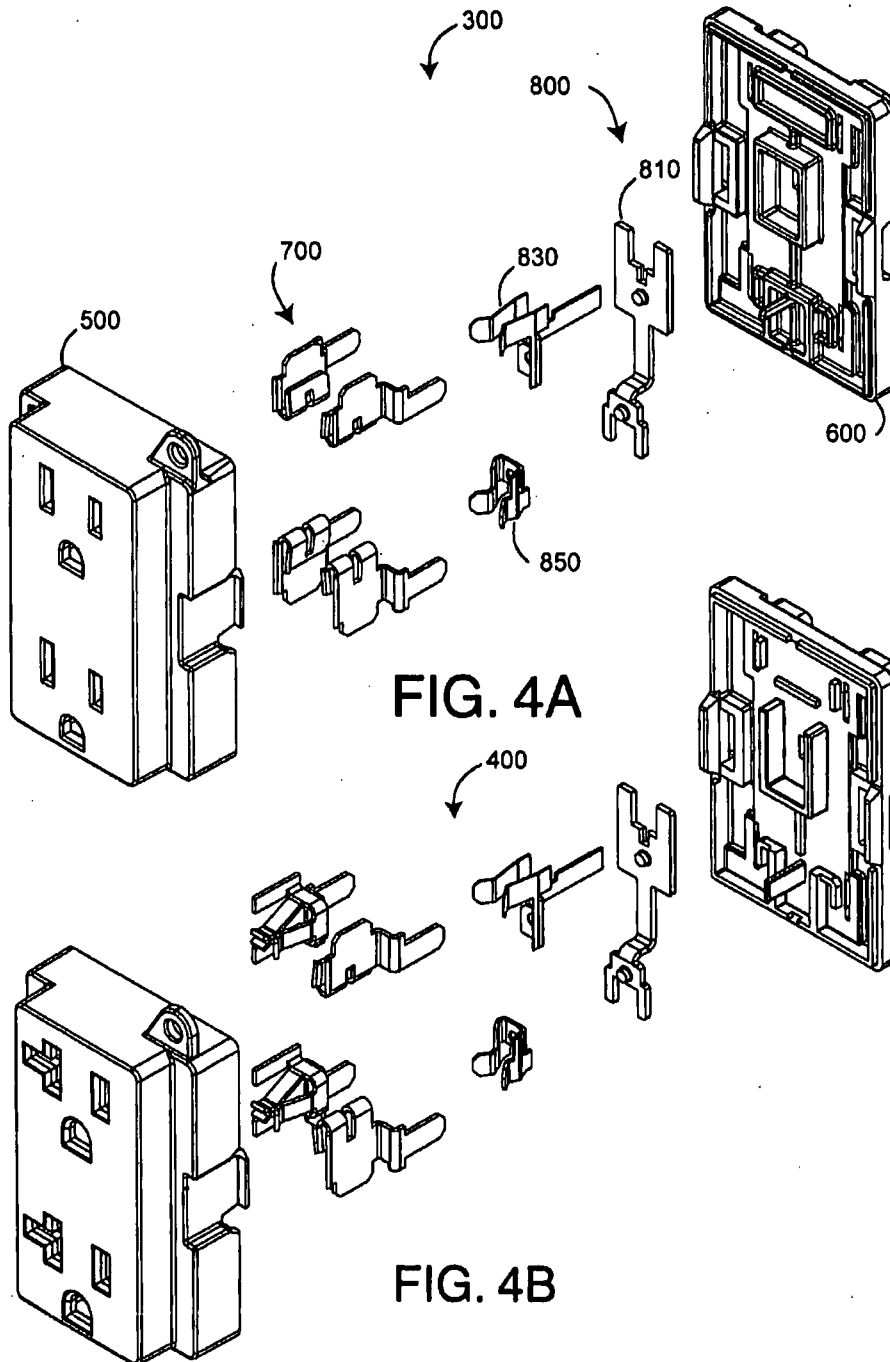
FIG. 3B

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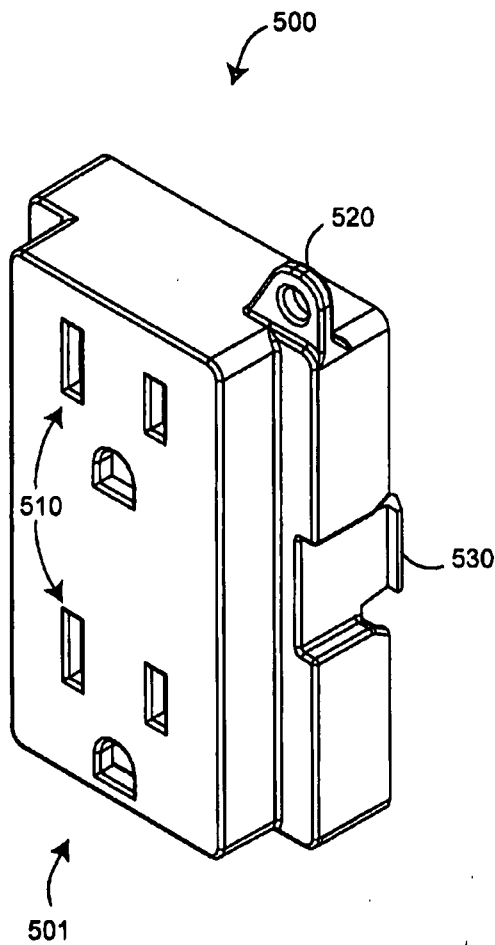


FIG. 5A

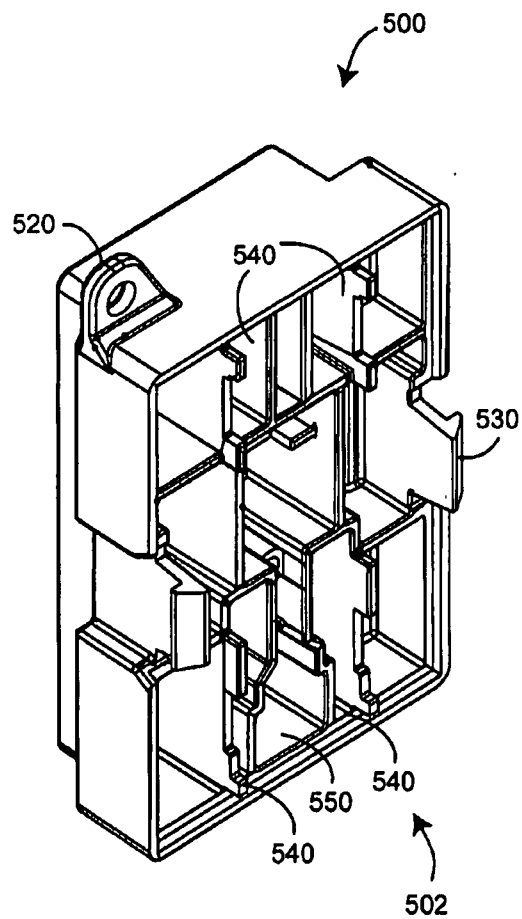


FIG. 5B

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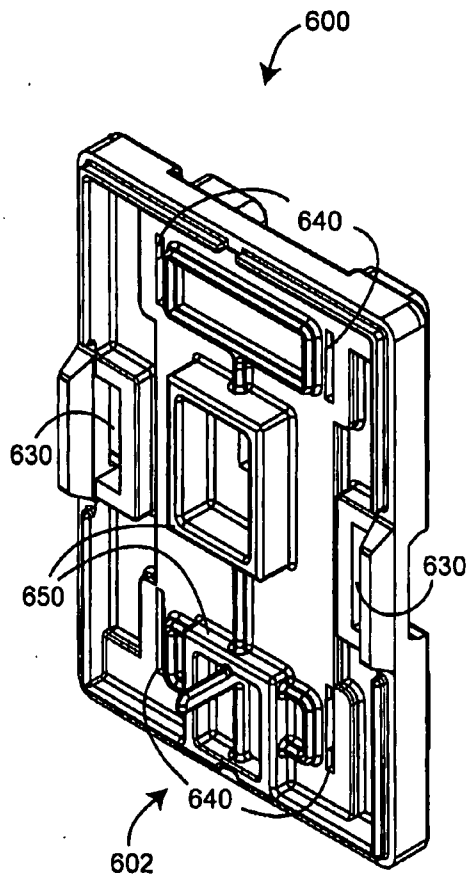


FIG. 6A

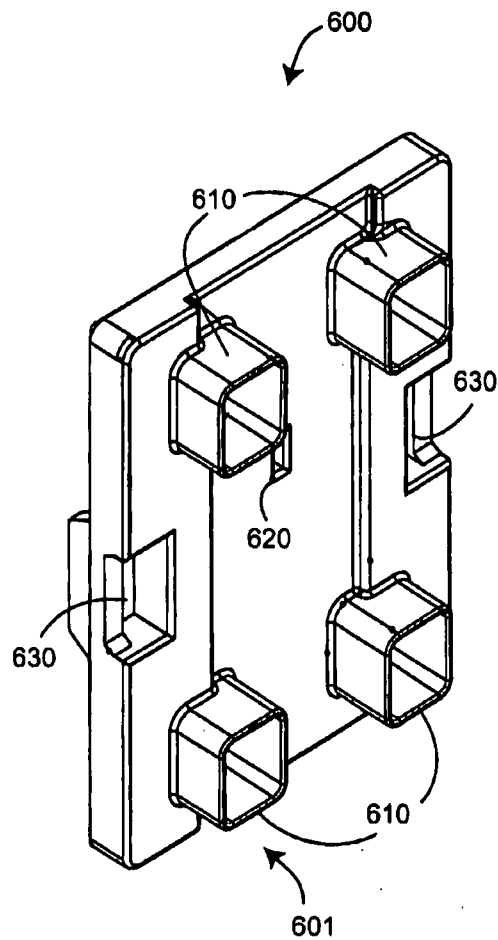


FIG. 6B

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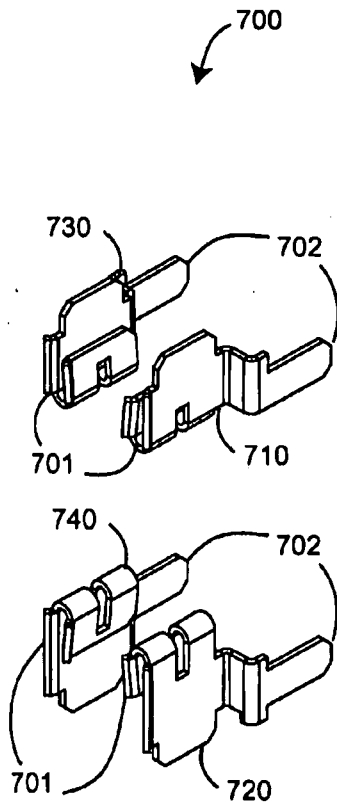


FIG. 7A

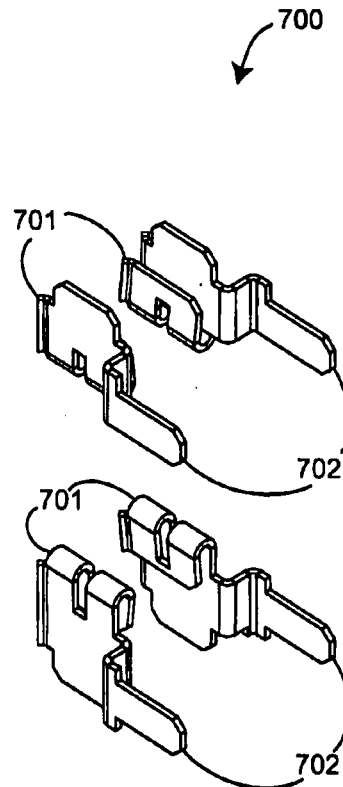


FIG. 7B

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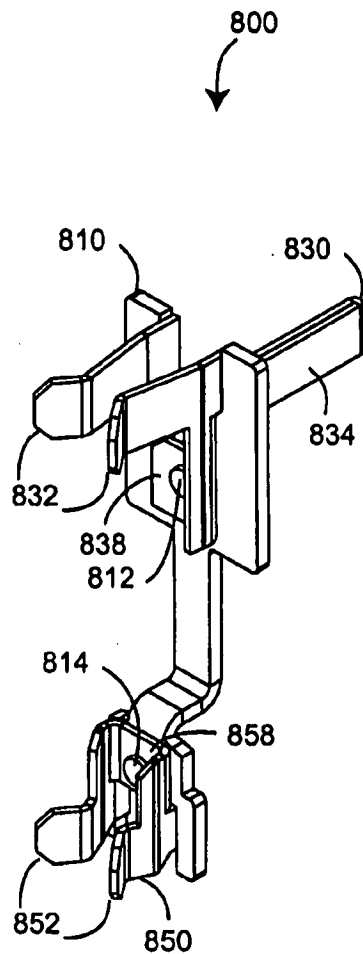


FIG. 8A

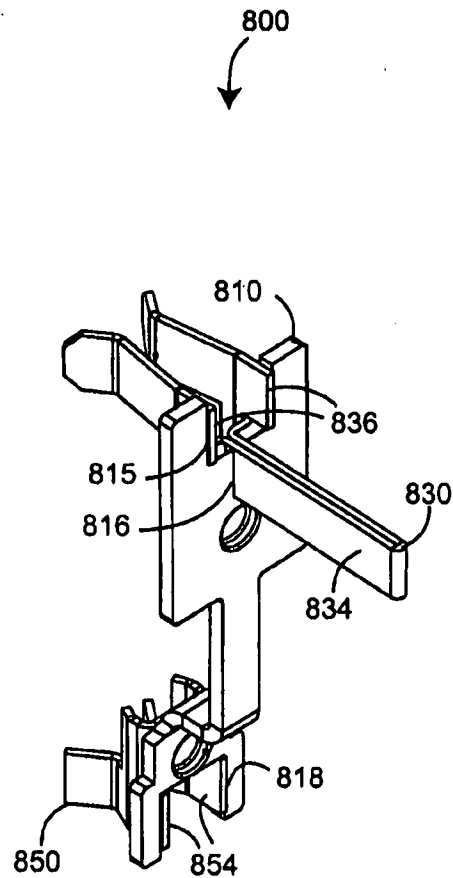


FIG. 8B

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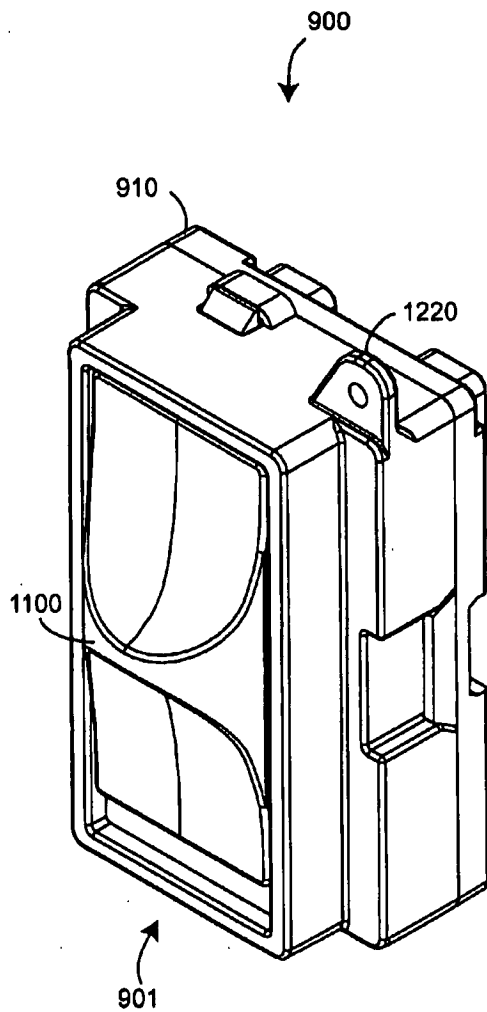


FIG. 9A

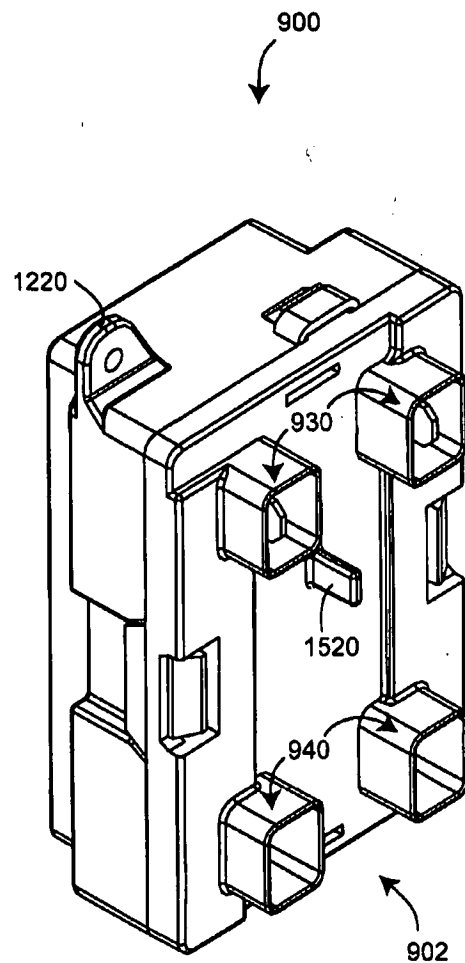


FIG. 9B

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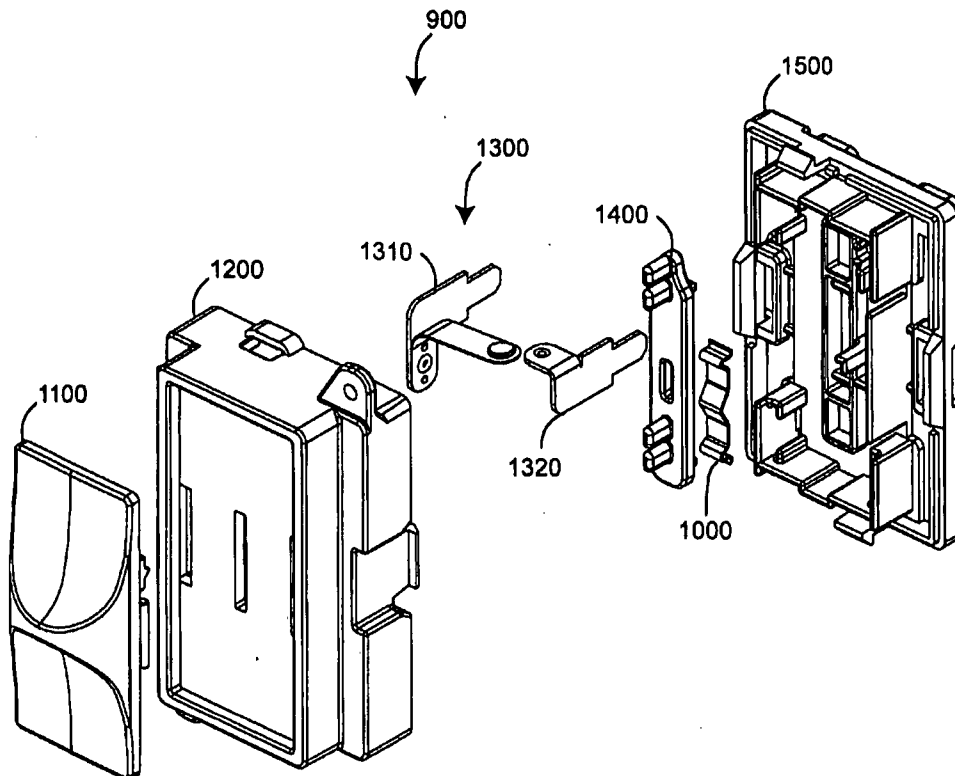


FIG. 10

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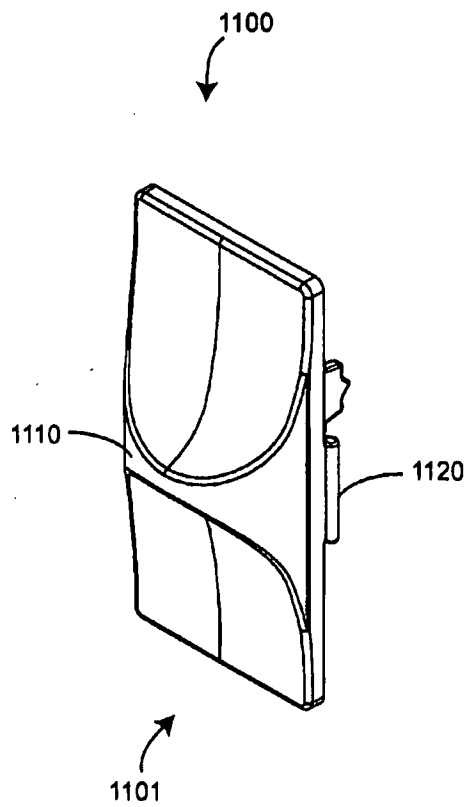


FIG. 11A

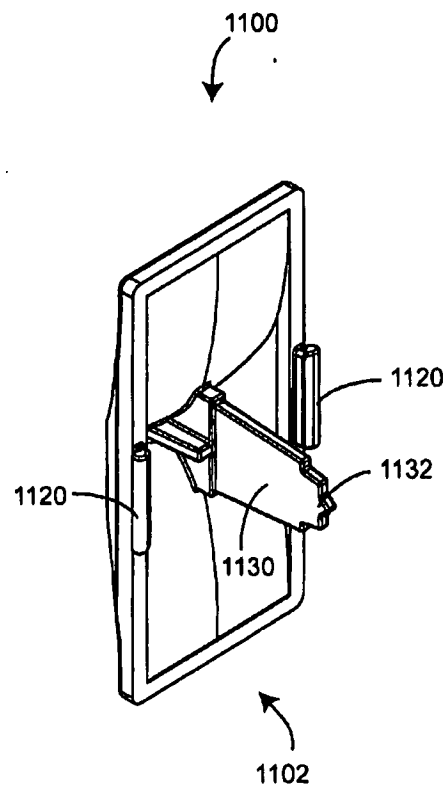


FIG. 11B

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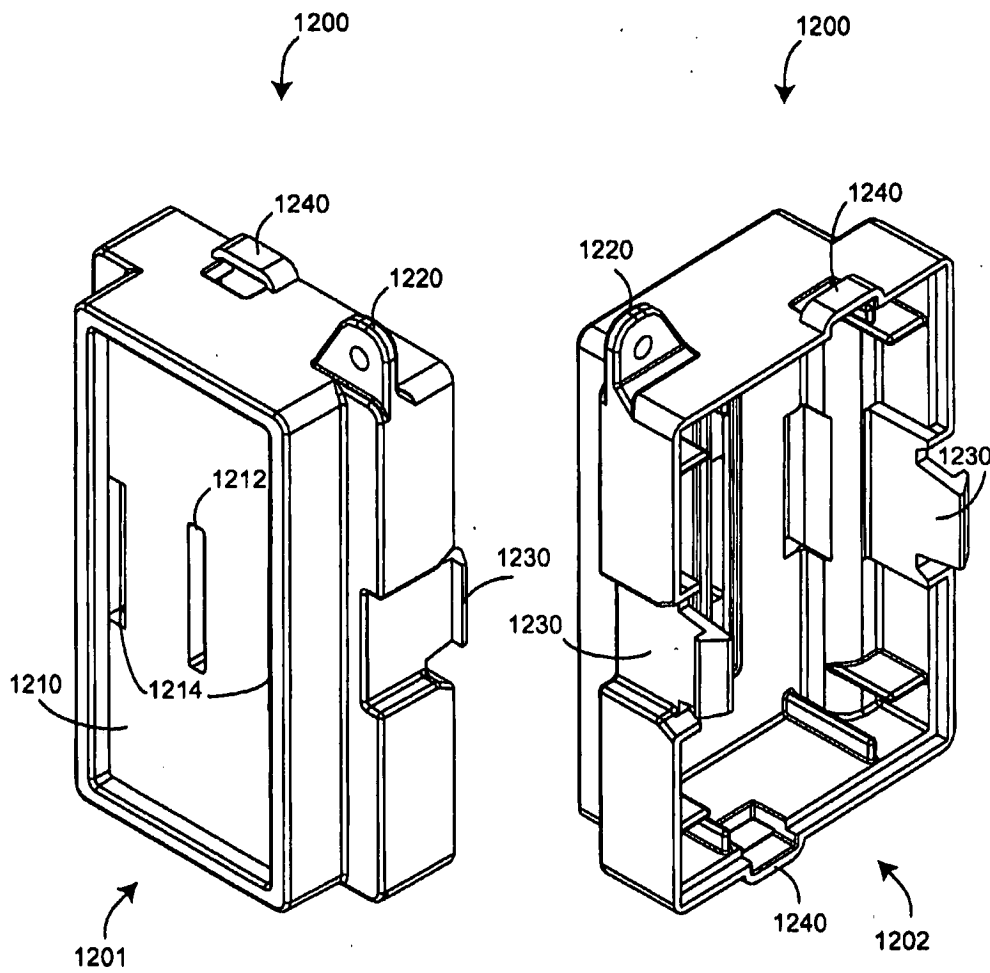


FIG. 12A

FIG. 12B

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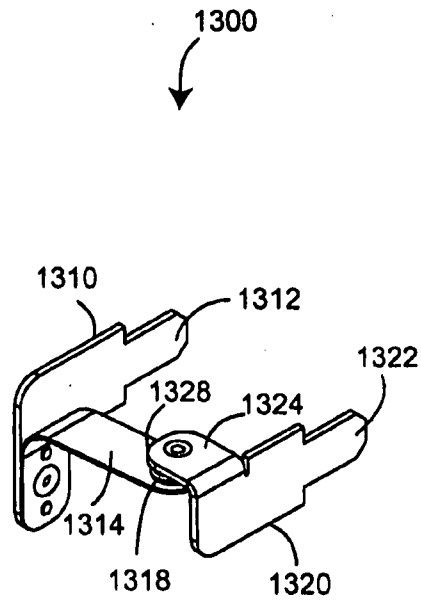


FIG. 13A

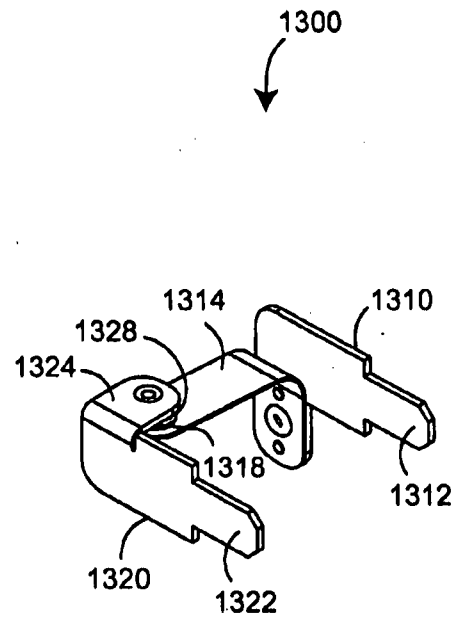


FIG. 13B

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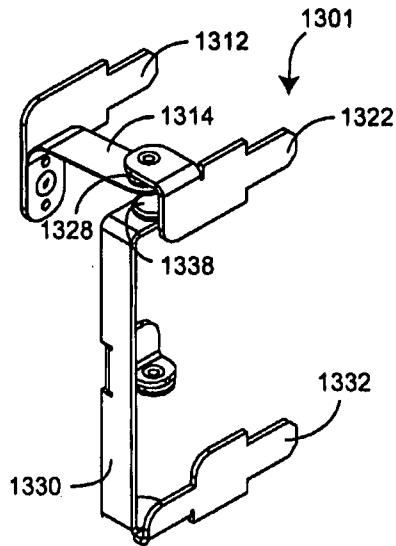


FIG. 13C

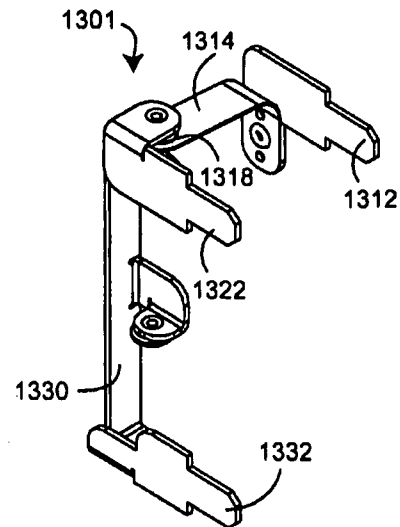


FIG. 13D

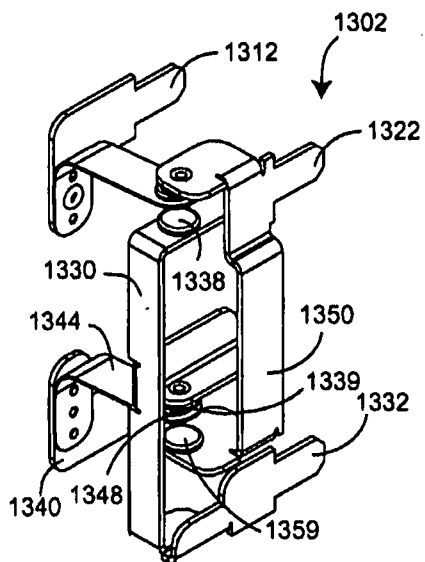


FIG. 13E

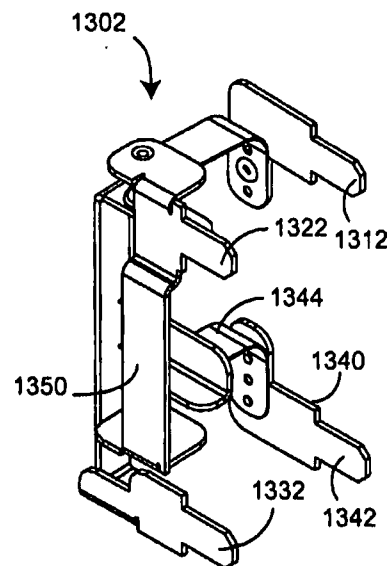


FIG. 13F

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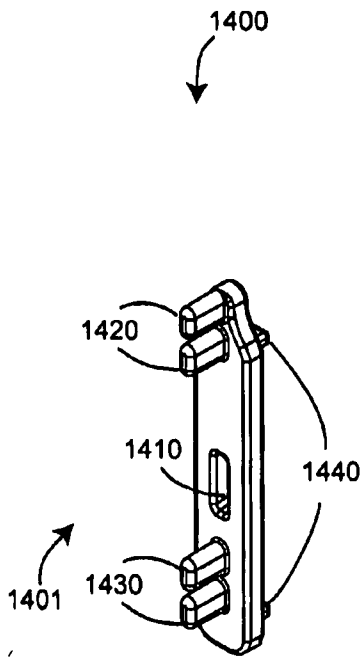


FIG. 14A

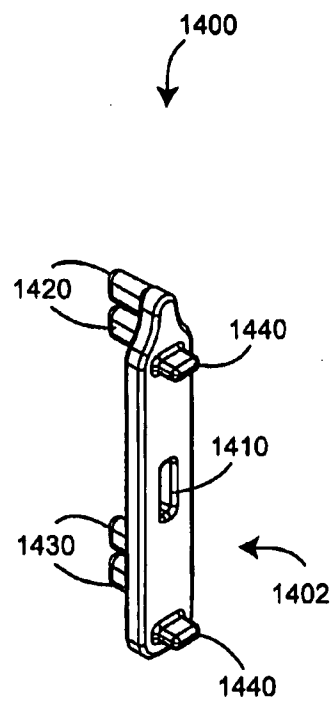


FIG. 14B

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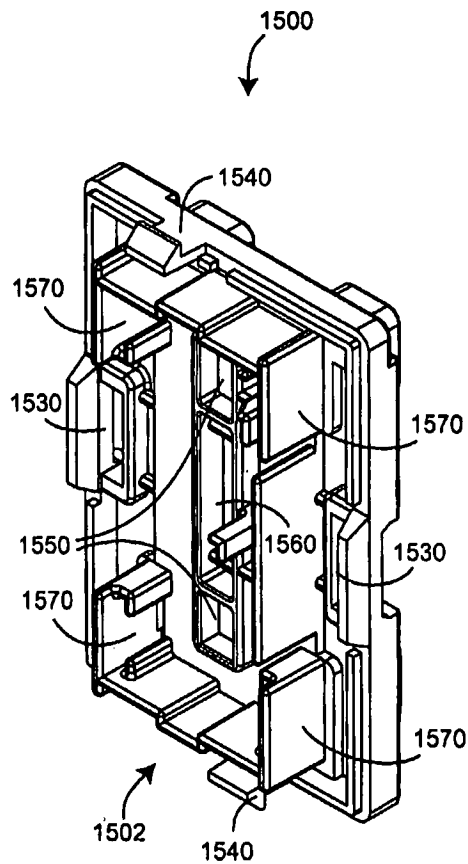


FIG. 15A

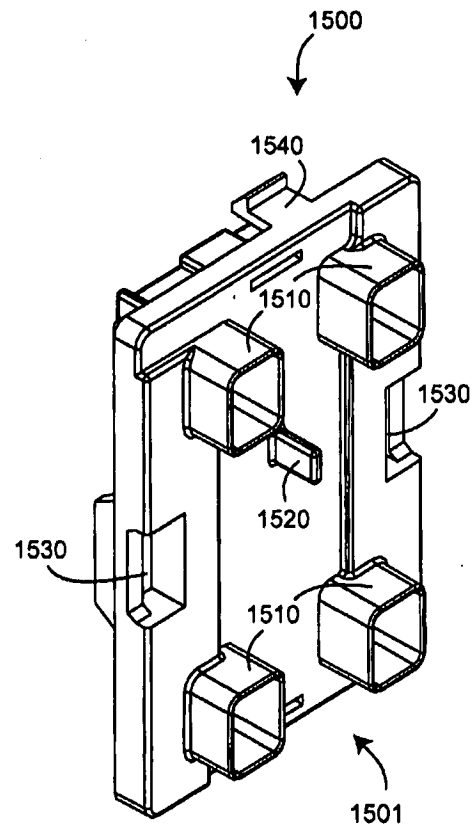


FIG. 15B

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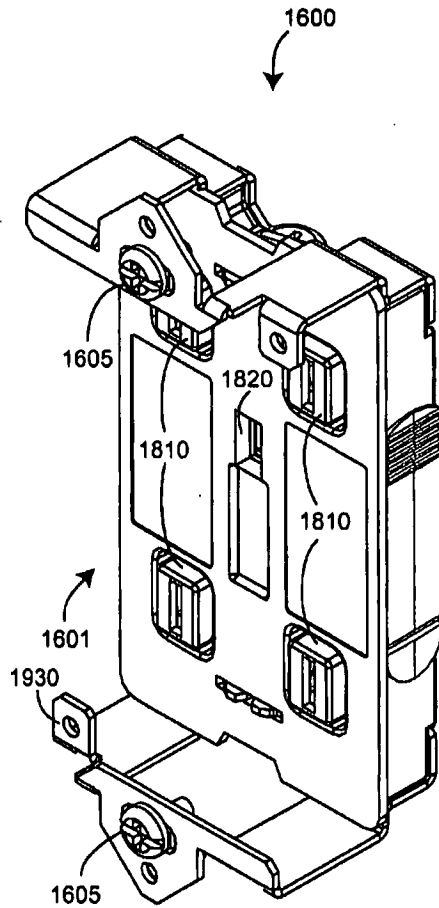


FIG. 16A

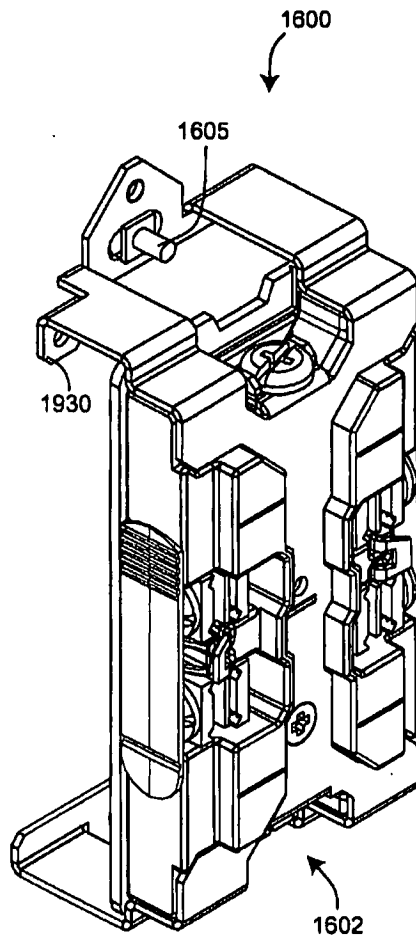


FIG. 16B

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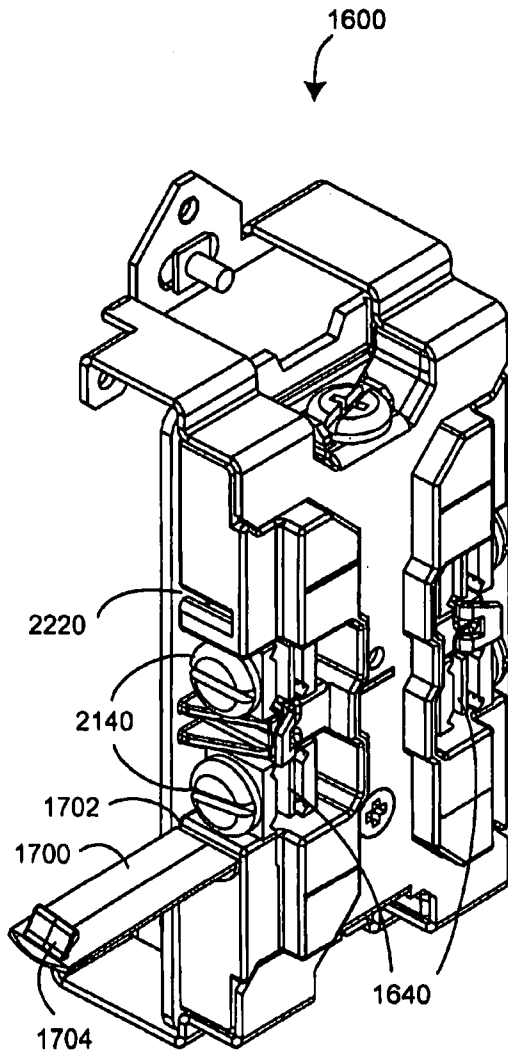


FIG. 16C

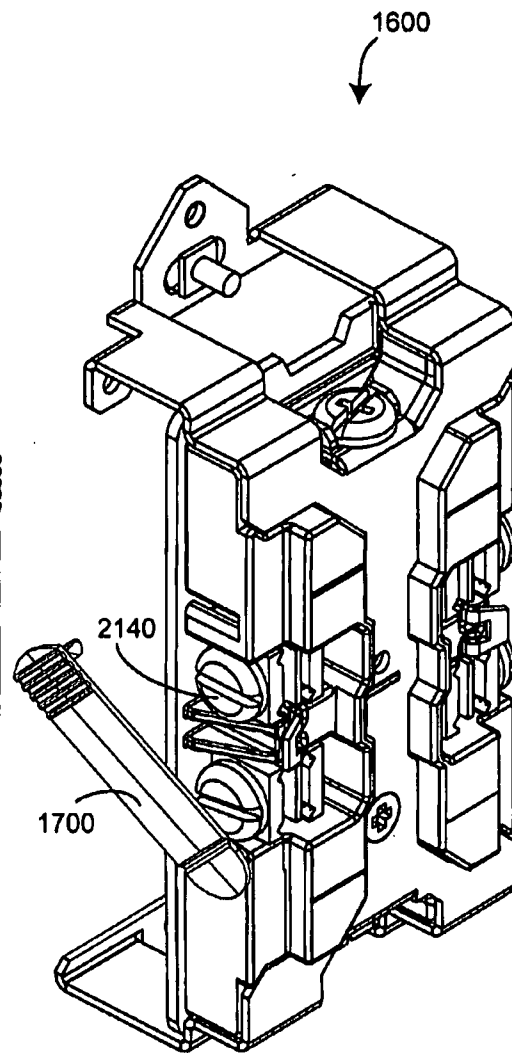


FIG. 16D

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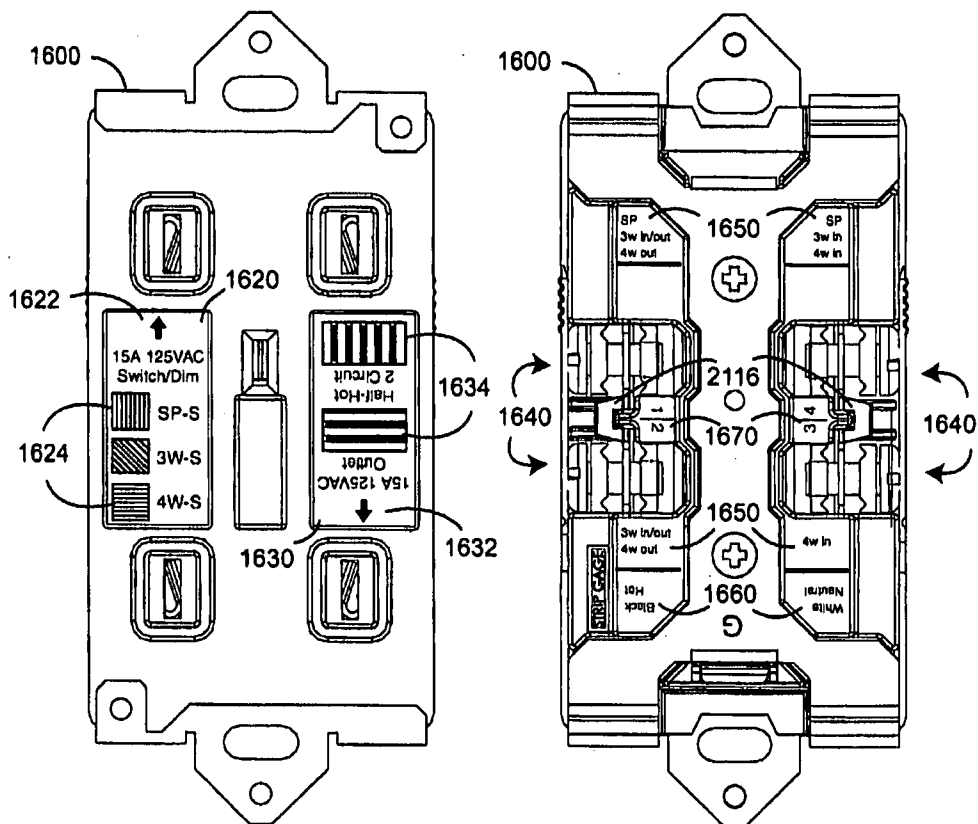


FIG. 16E

FIG. 16F

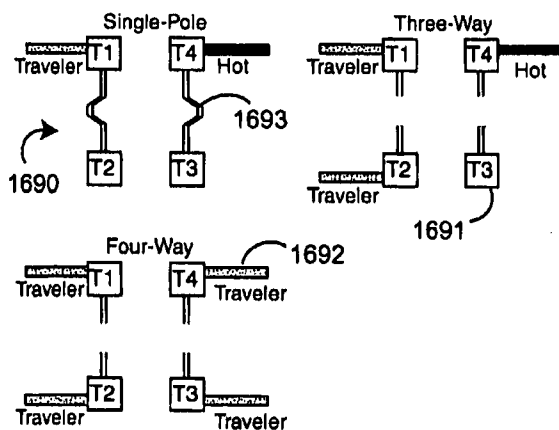


FIG. 16G

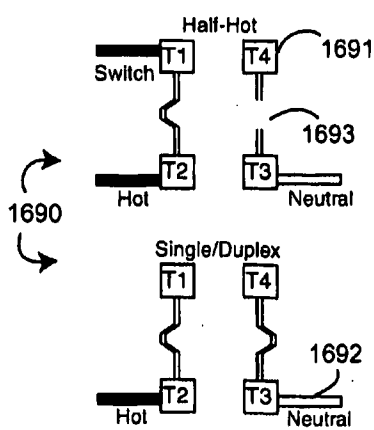


FIG. 16H

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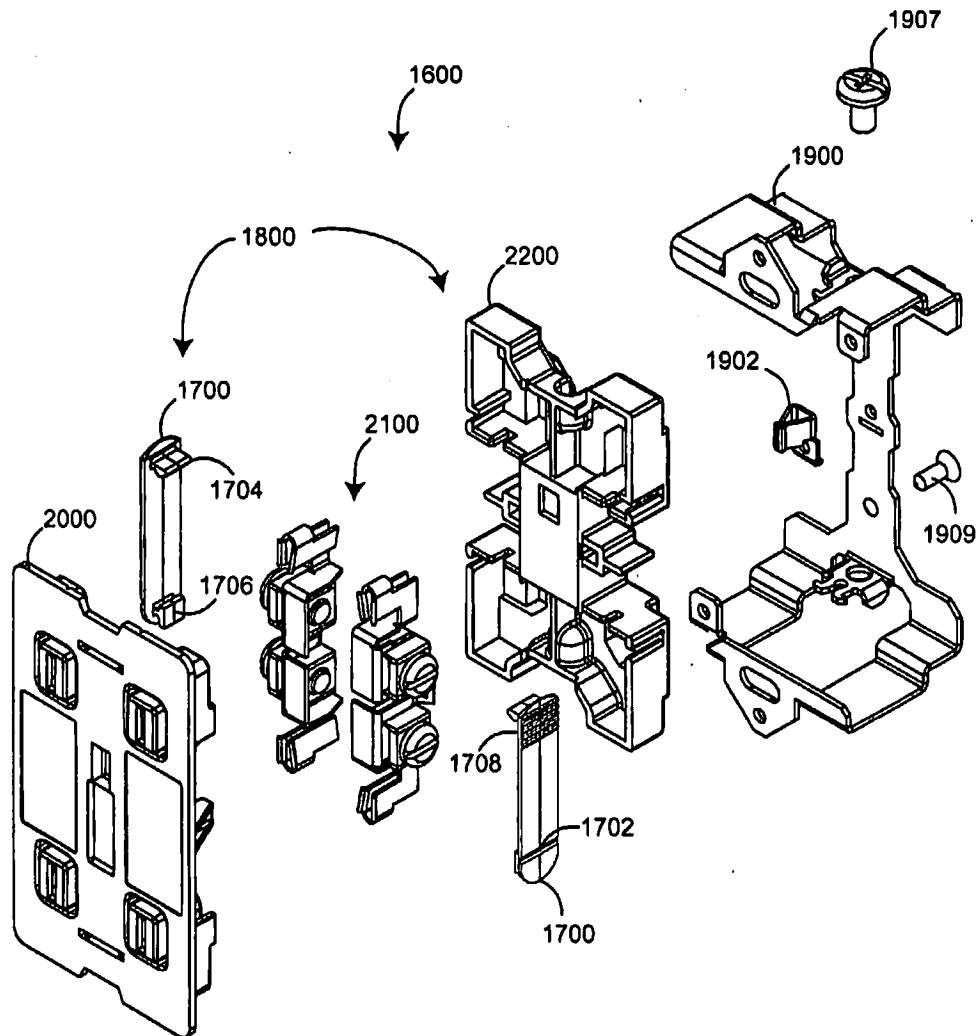


FIG. 17A

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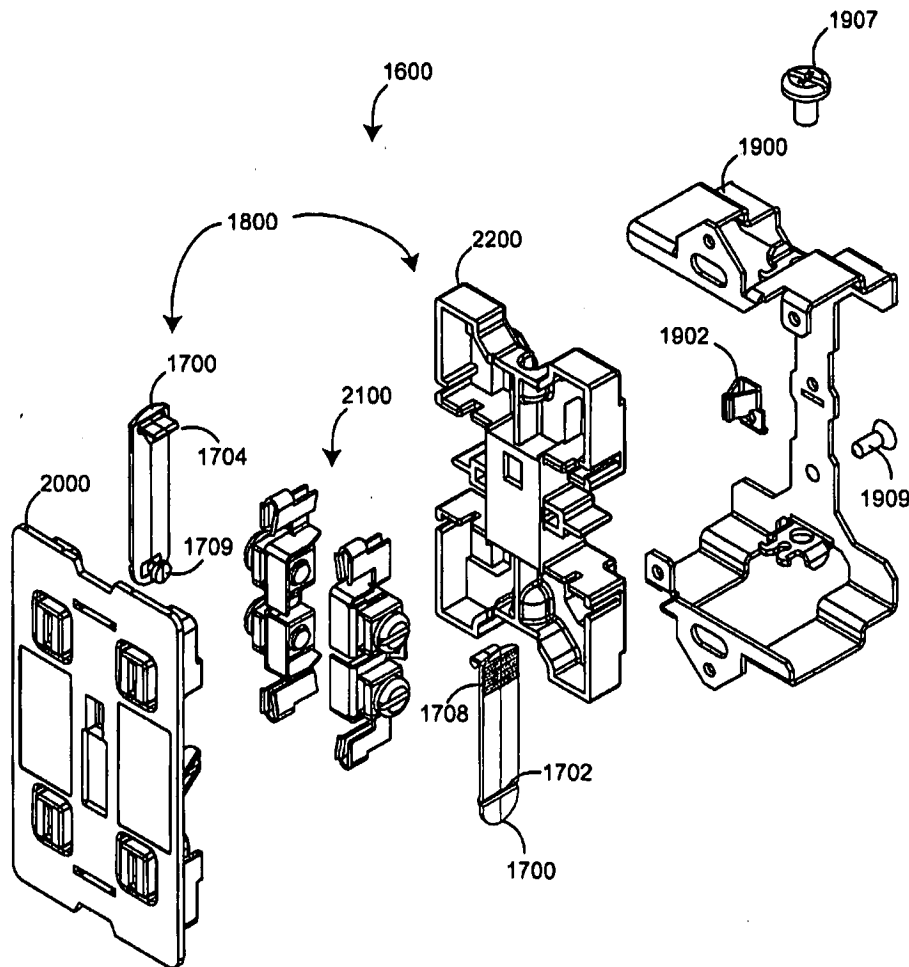


FIG. 17B

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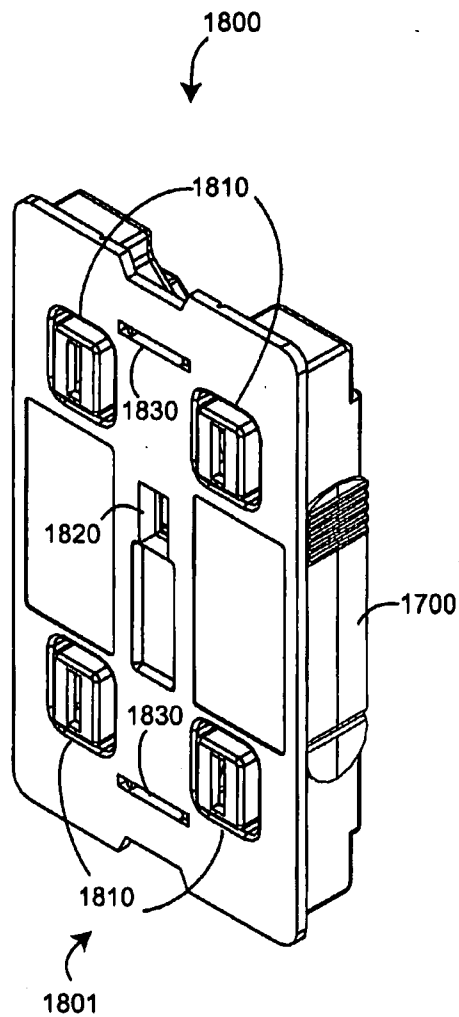


FIG. 18A

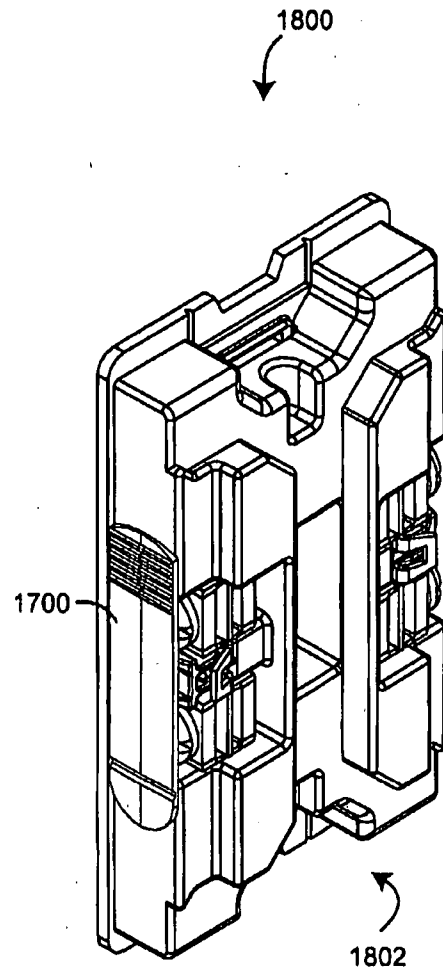


FIG. 18B

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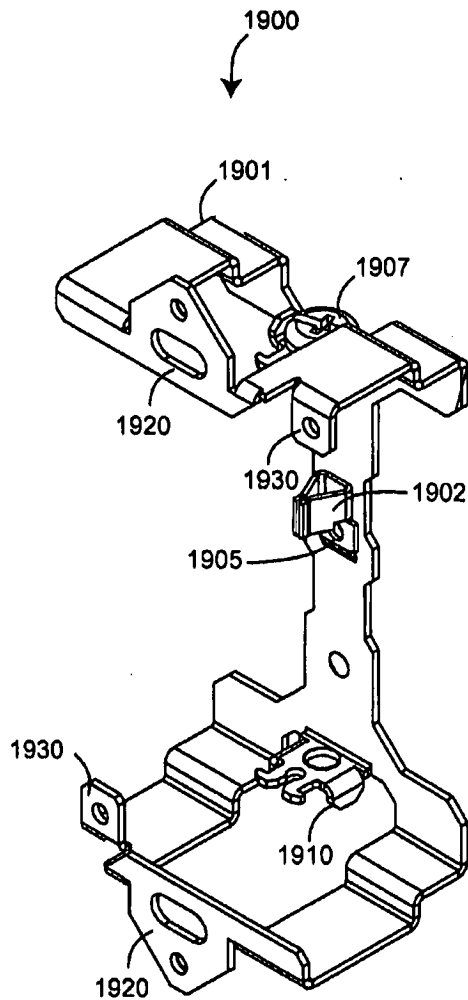


FIG. 19A

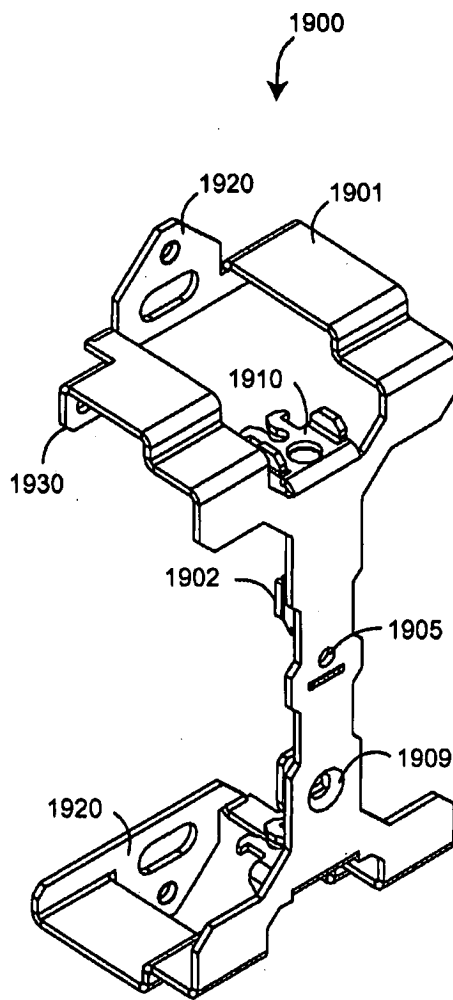


FIG. 19B

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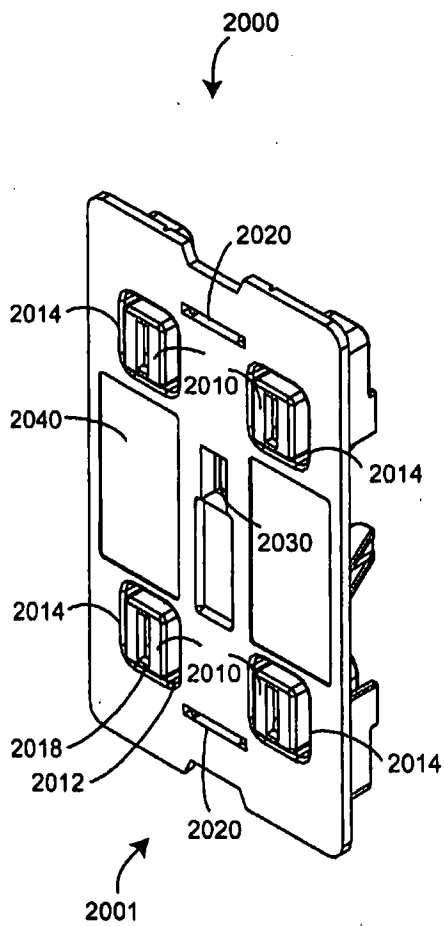


FIG. 20A

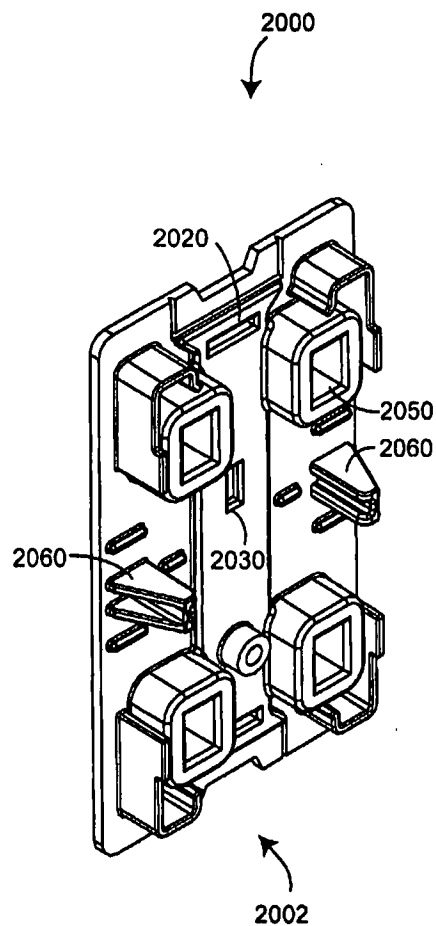


FIG. 20B

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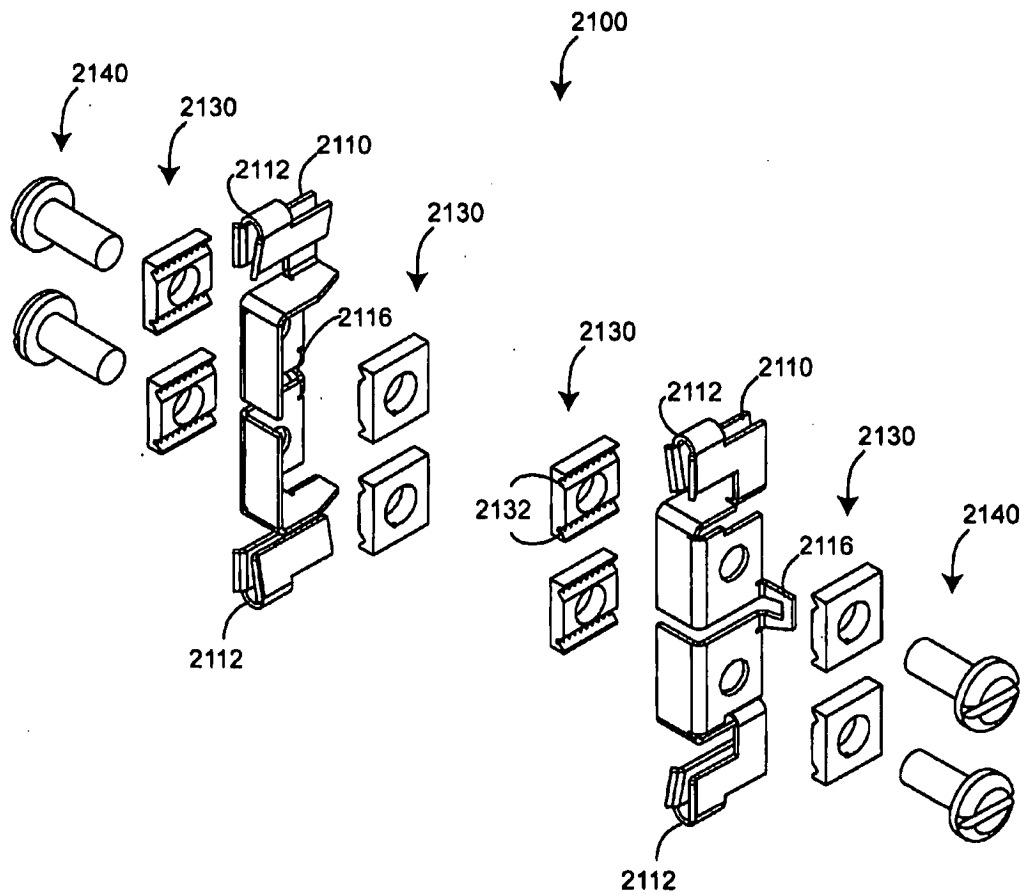


FIG. 21

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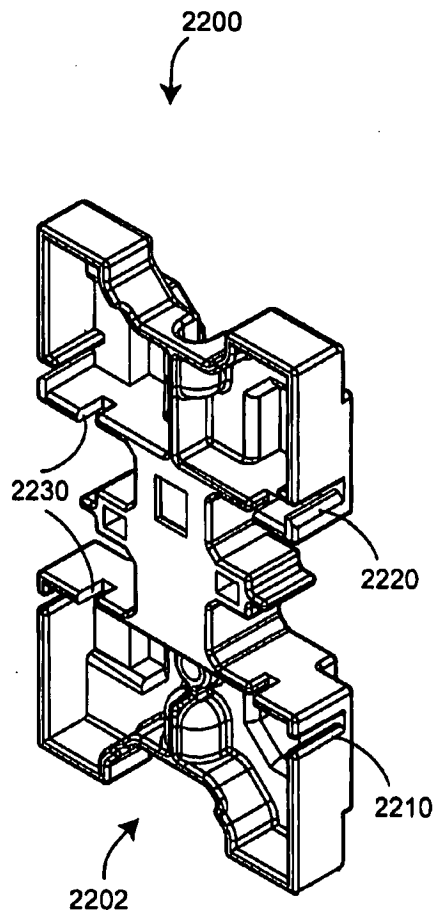


FIG. 22A

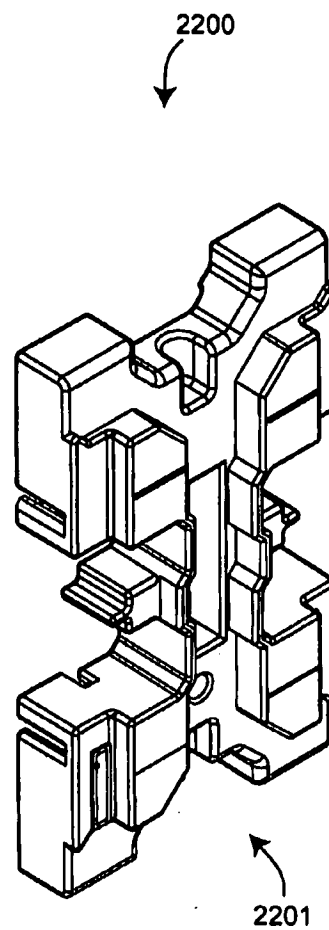


FIG. 22B

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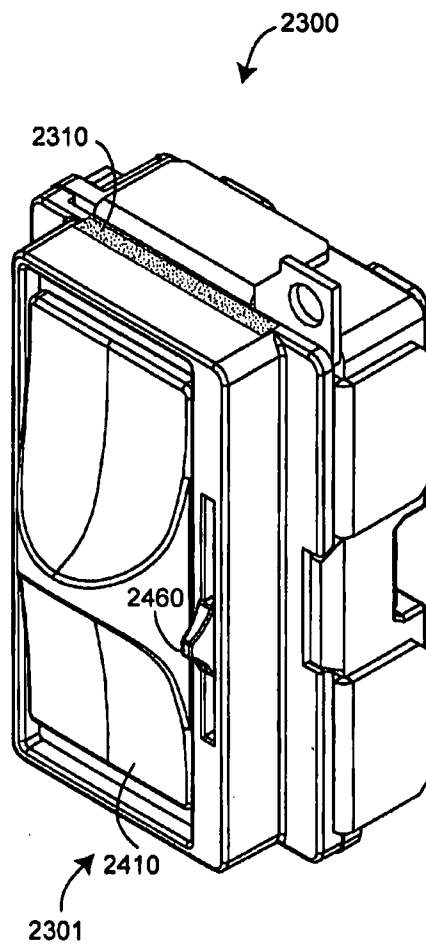


FIG. 23A

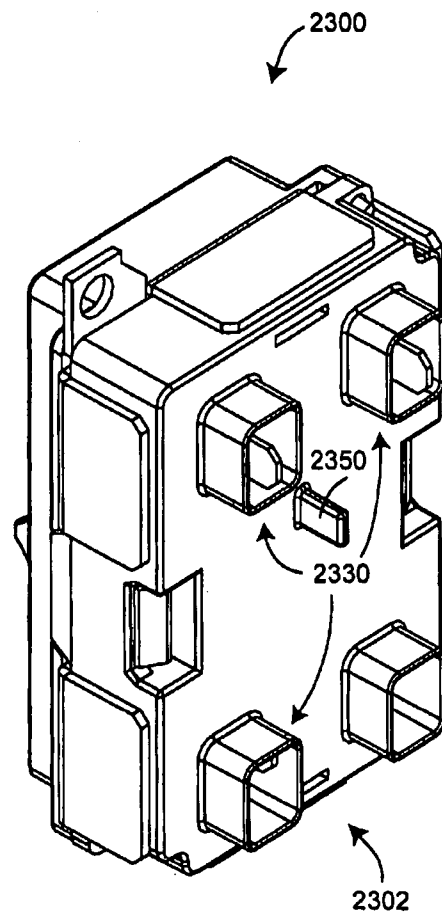


FIG. 23B

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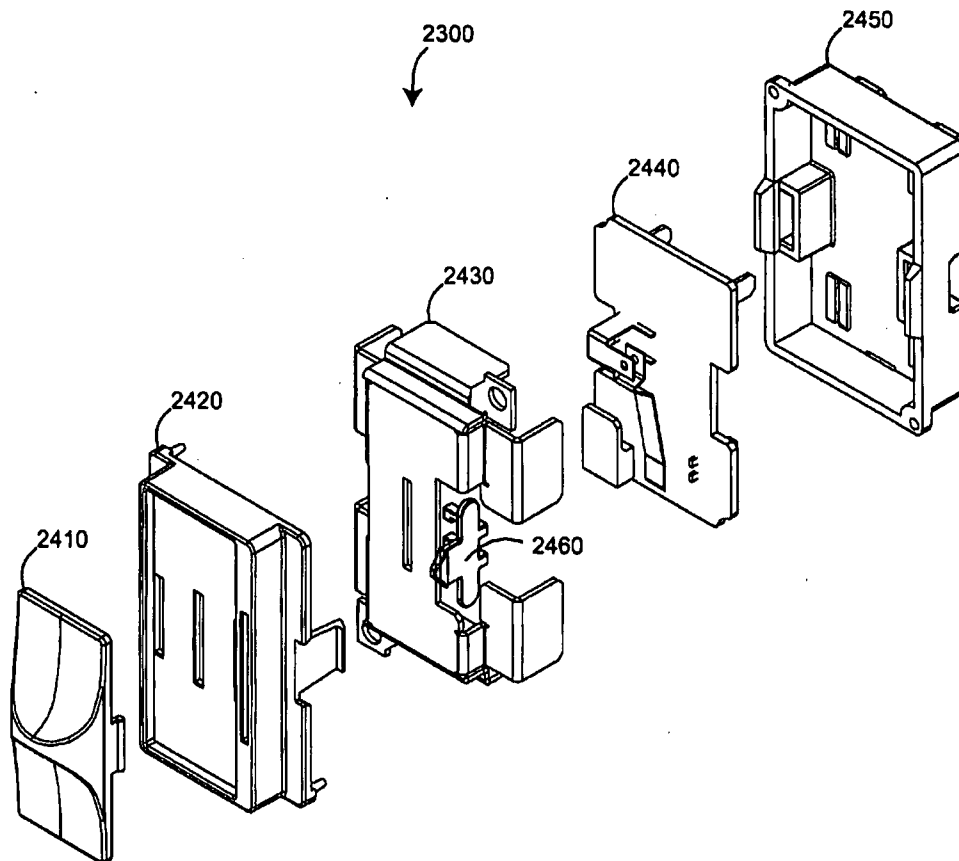


FIG. 24

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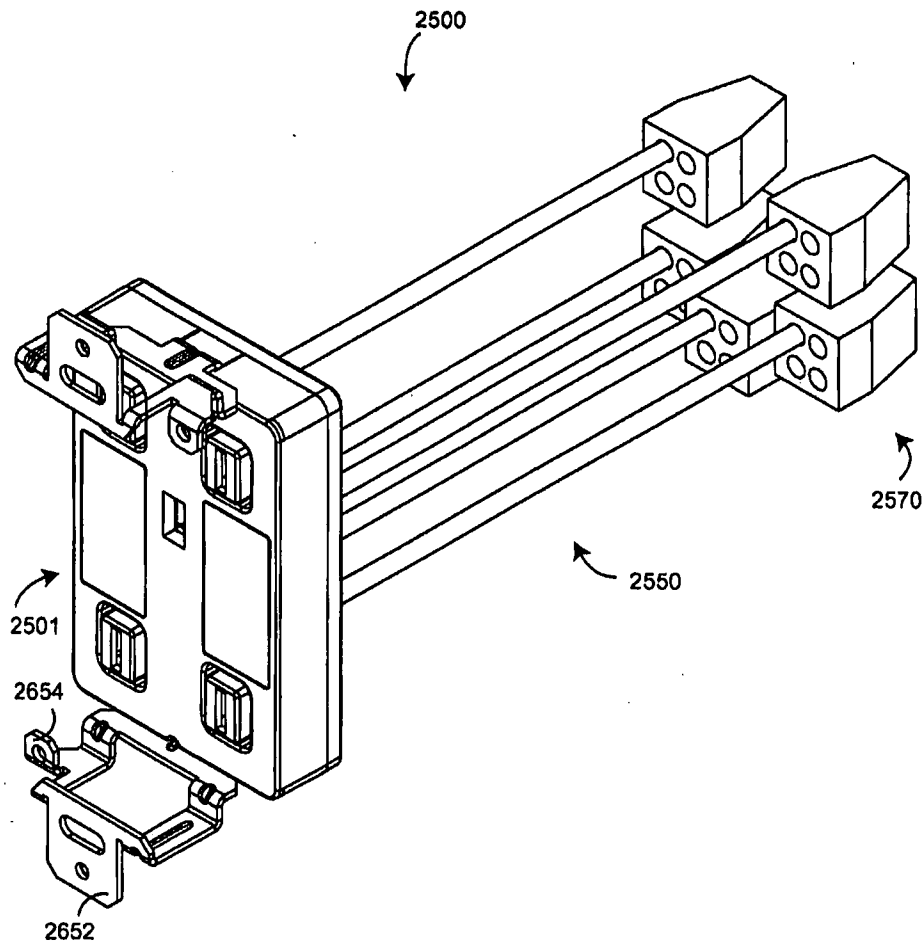


FIG. 25A

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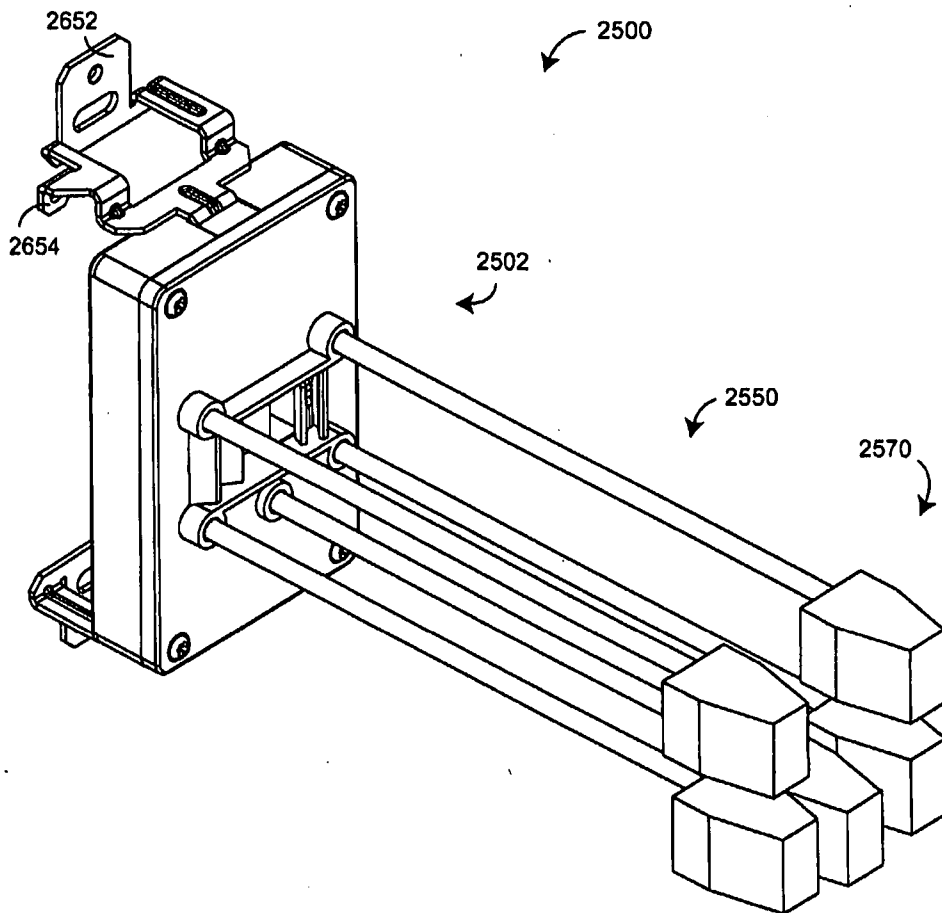


FIG. 25B

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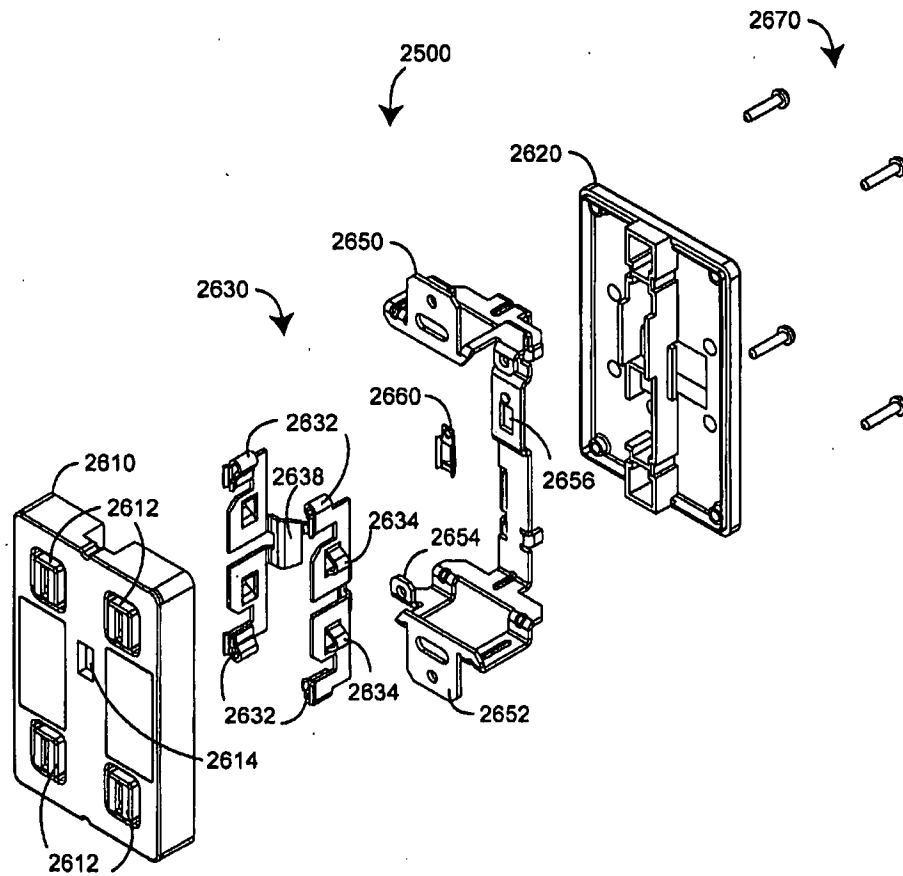


FIG. 26A

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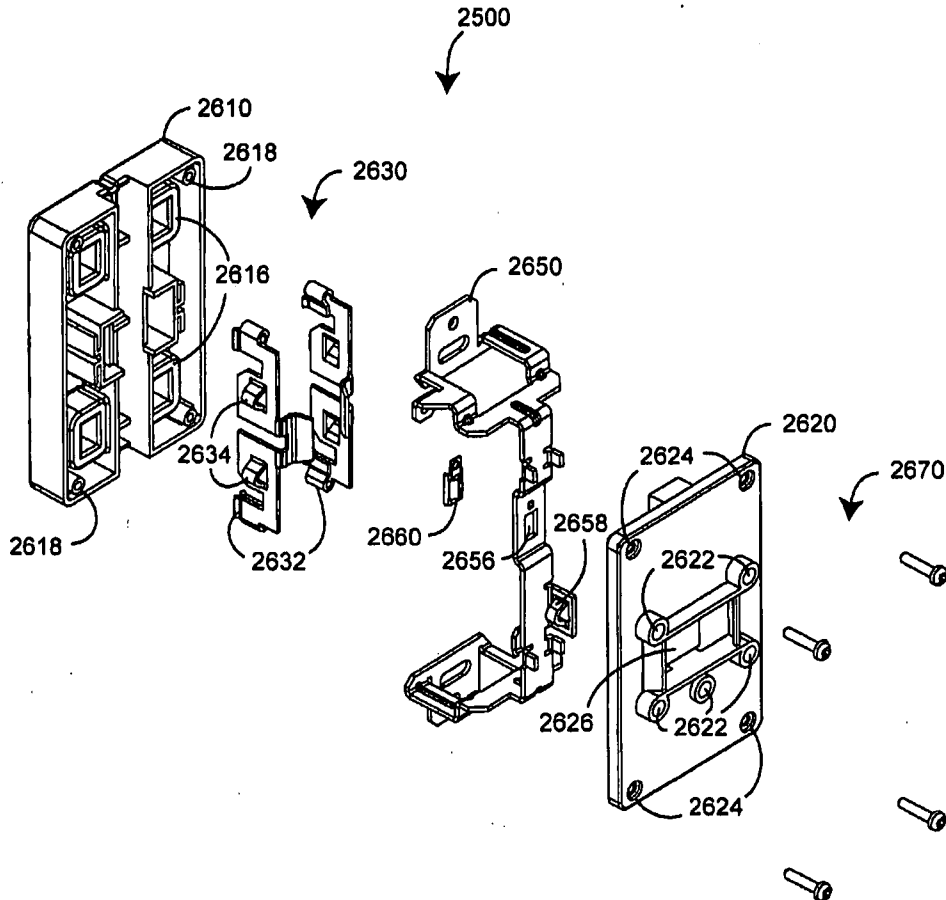


FIG. 26B

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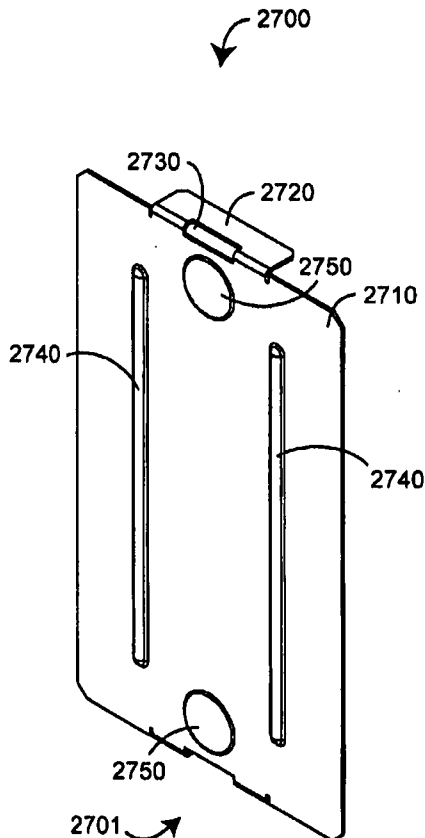


FIG. 27A

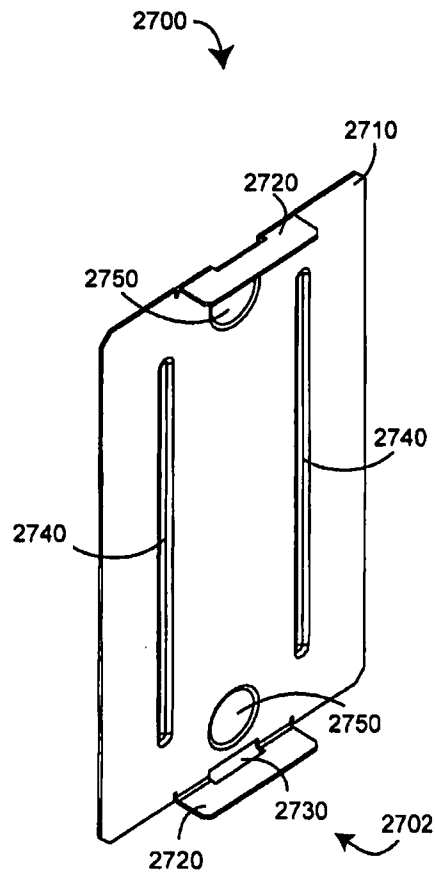


FIG. 27B

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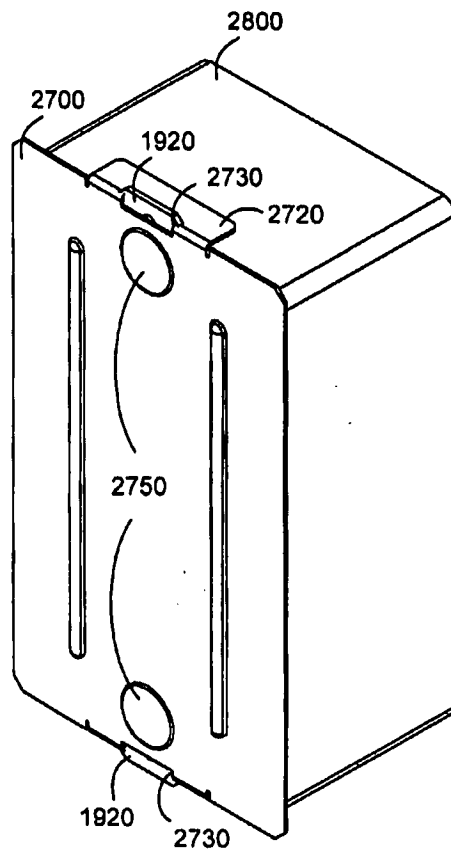


FIG. 28A

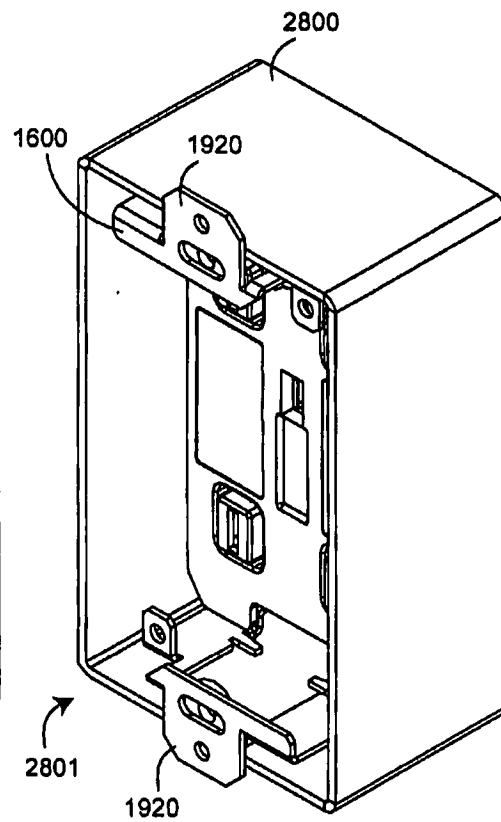


FIG. 28B

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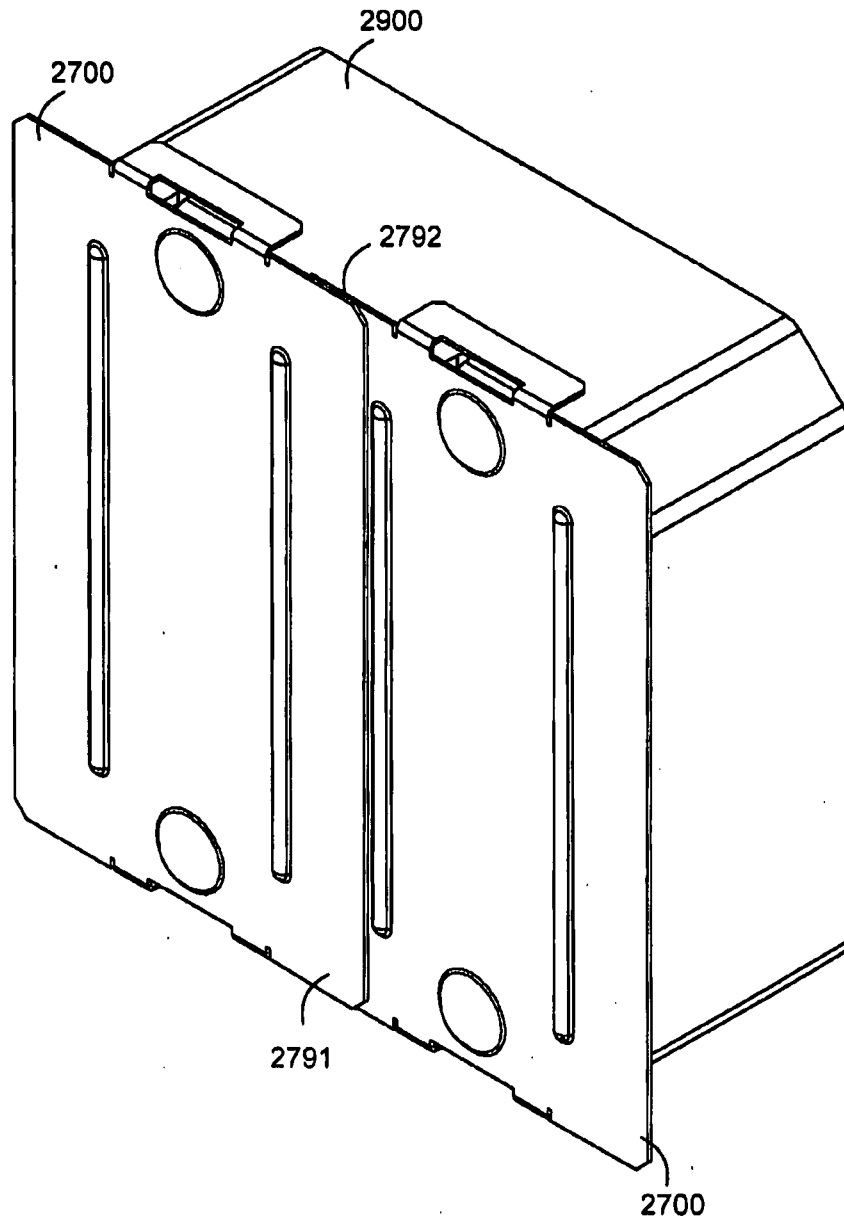


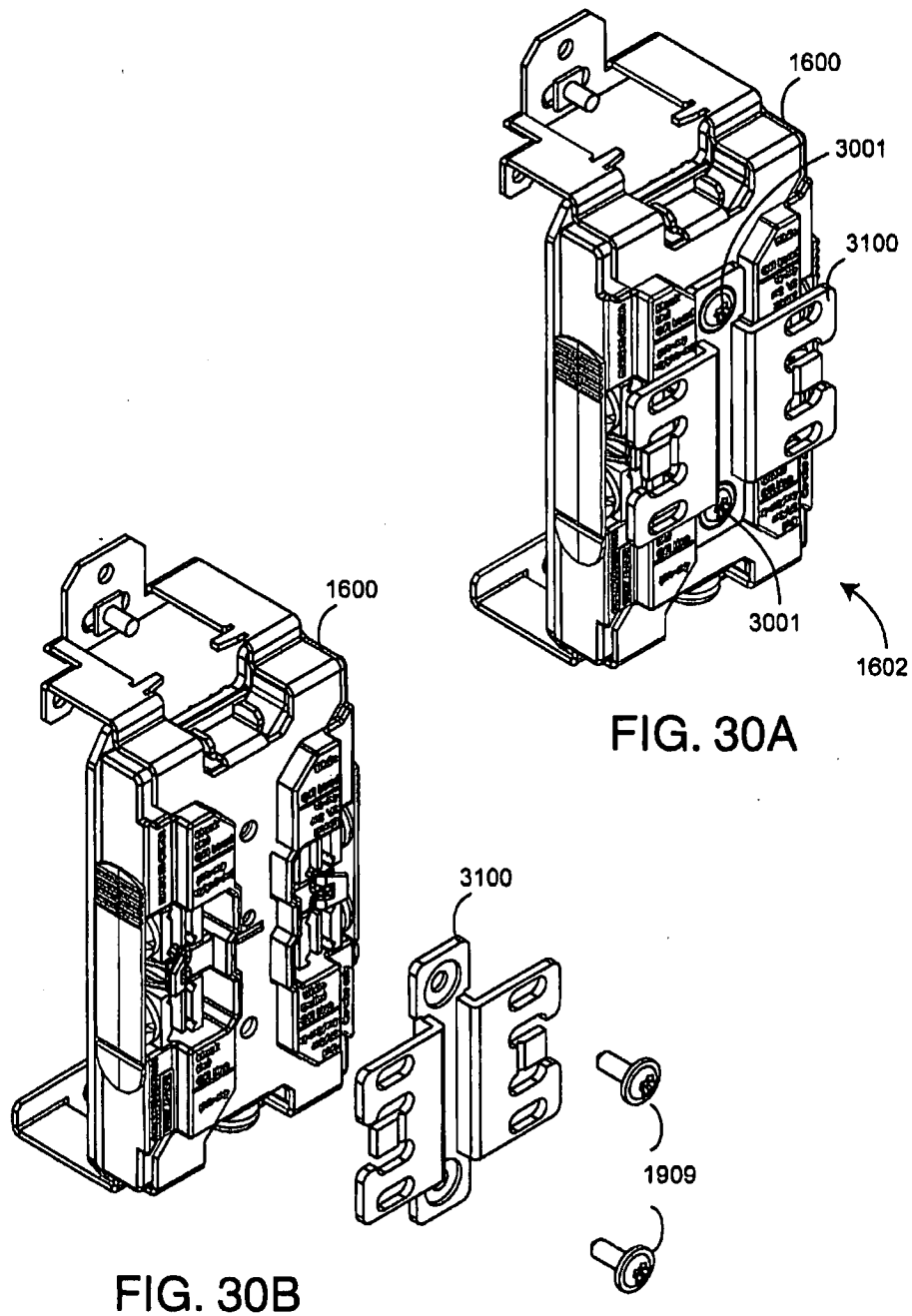
FIG. 29

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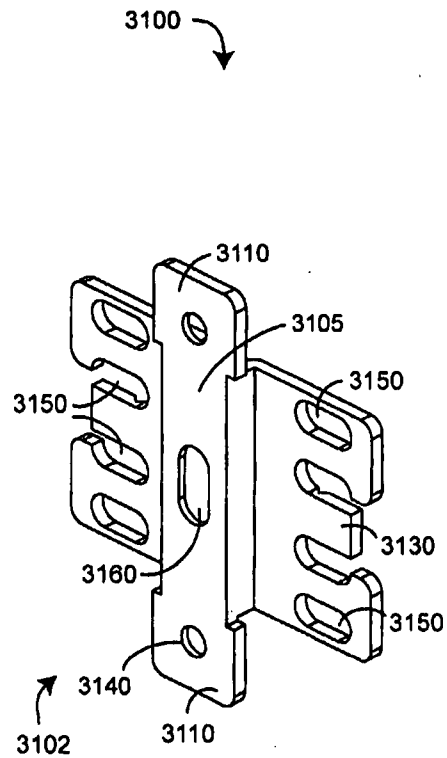
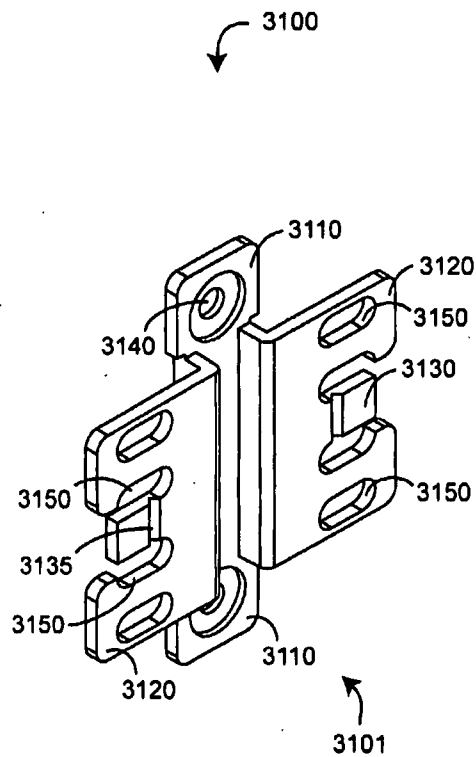


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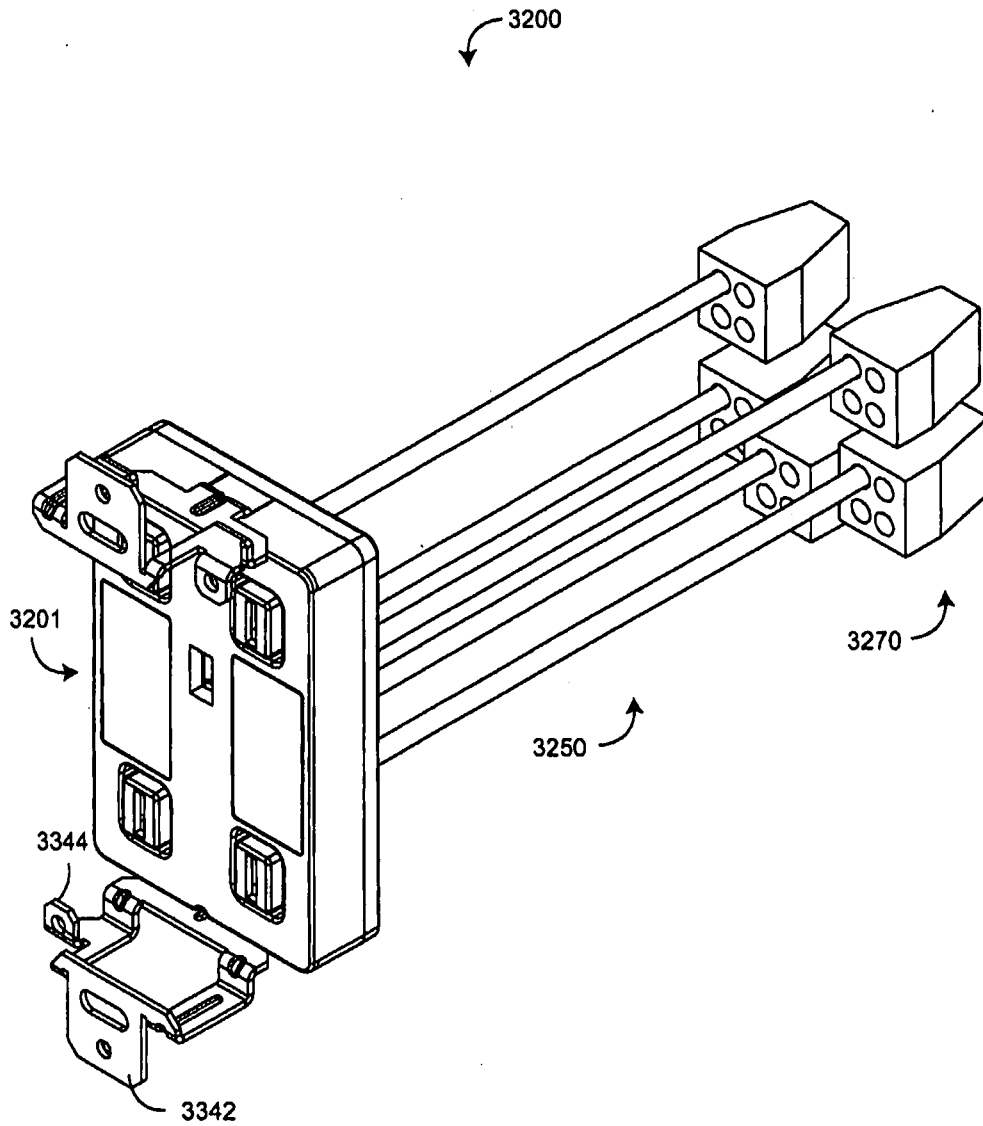


FIG. 32A

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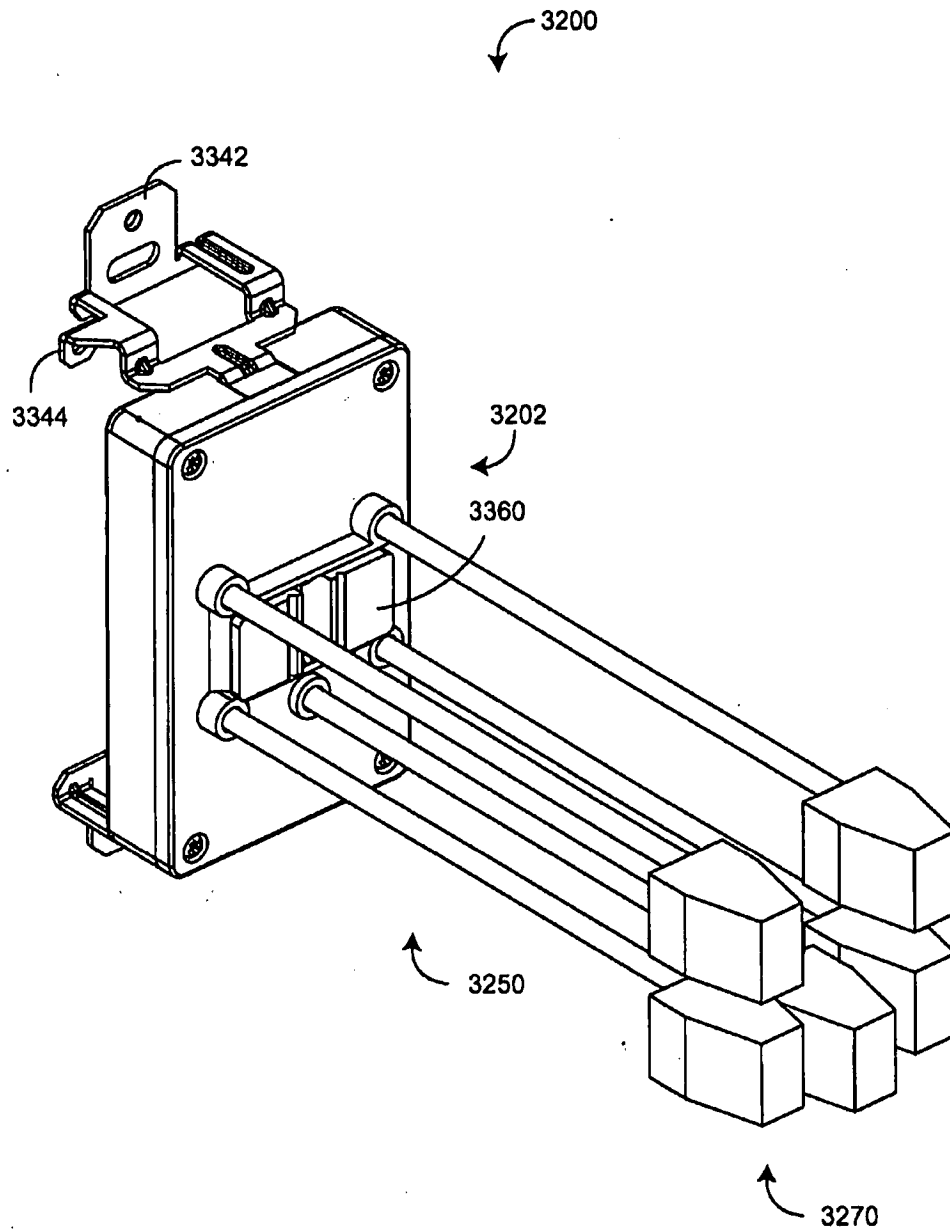


FIG. 32B

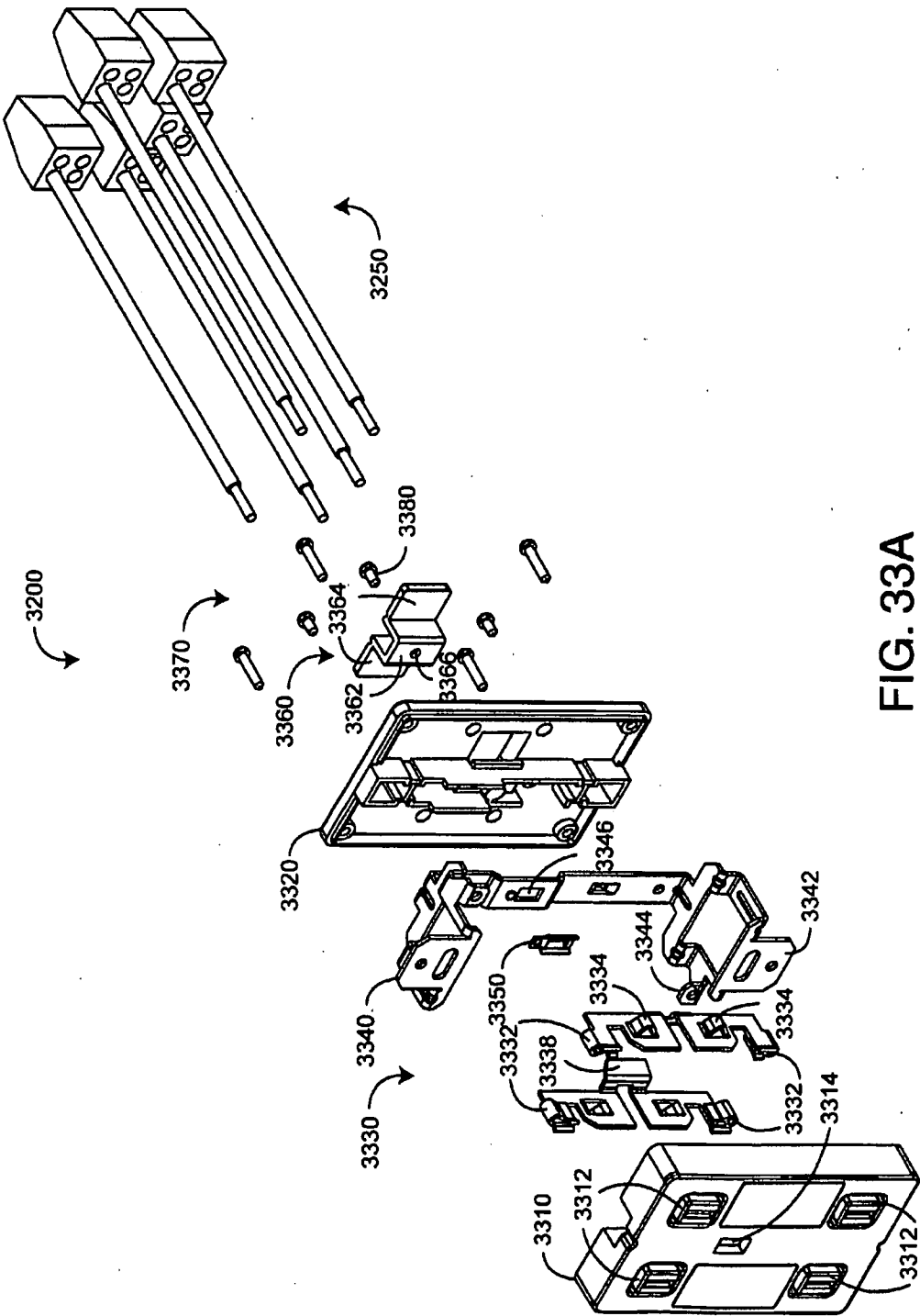


FIG. 33A

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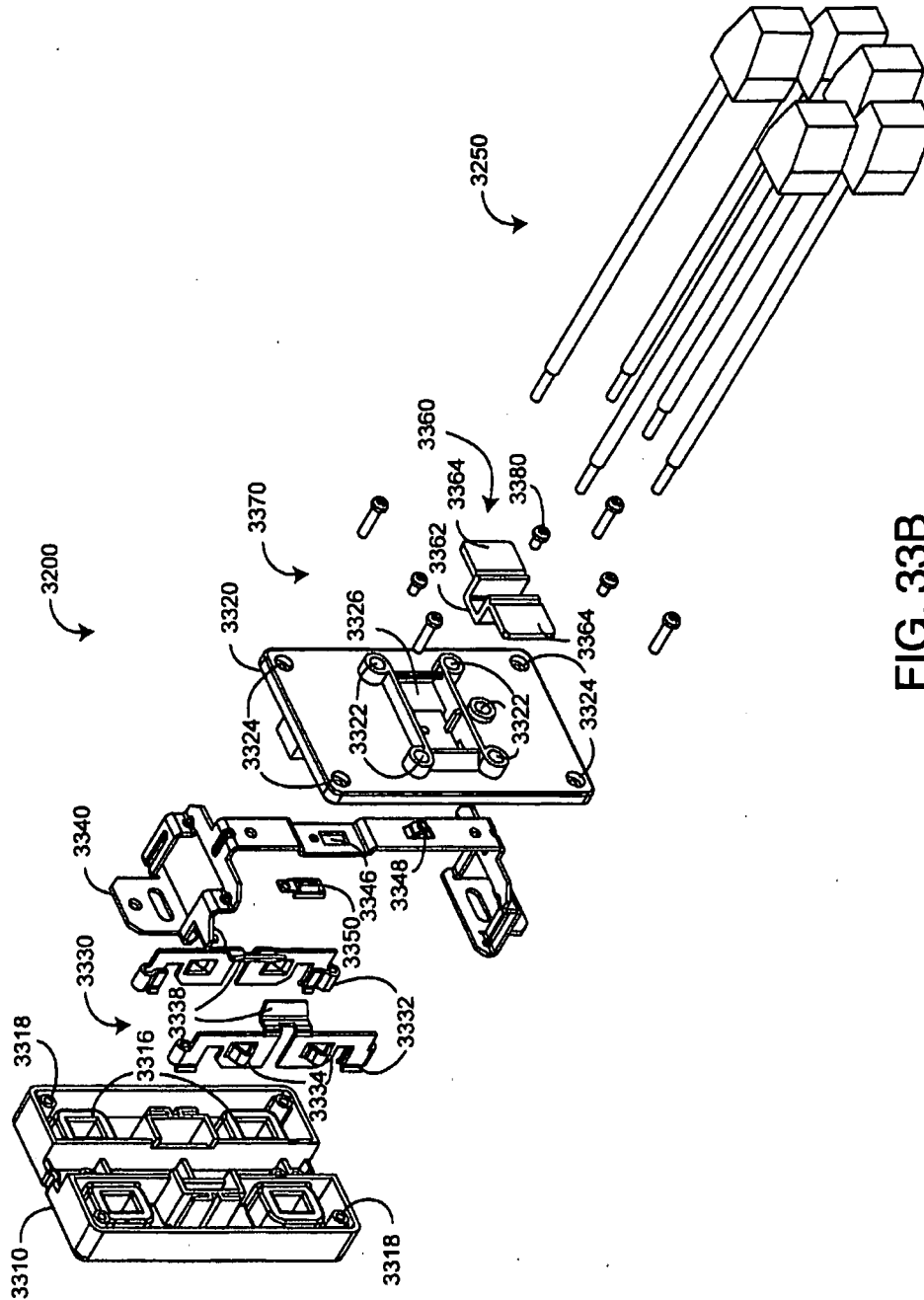


FIG. 33B

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ELECTRICAL DISTRIBUTION WIRING MODULE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a divisional of U.S. patent application Ser. No. 10/443,444 entitled Safety Module Electrical Distribution System, filed May 22, 2003, now U.S. Pat. No. 6,884,111 which relates to and claims the benefit of prior U.S. Provisional Applications No. 60/383,269 entitled Safety Plug-In Module Electrical Distribution System, filed May 23, 2002, and No. 60/441,852 entitled Safety Module Electrical Distribution System, filed Jan. 21, 2003. This application also relates to and claims the benefit of prior U.S. Provisional Application No. 60/631,244 entitled Sealed Wiring Module, filed Nov. 26, 2004. All of the aforementioned prior applications incorporated by reference herein.

BACKGROUND OF THE INVENTION

Standard AC electrical systems are comprised of an electrical box and an electrical device, such as an outlet or switch, installed within the box. During a roughing phase of construction, electrical boxes are mounted to wall studs at predetermined locations. After the boxes are installed, a journeyman electrician routes power cables through building framing to the appropriate boxes. The power cable is fed through openings in the rear or sides of the electrical boxes and folded back into the boxes, unterminated, so as to be out of the way until the next phase. During a makeup phase, wall panels are installed and painted, and the journeyman returns to the construction site to install the electrical devices into the boxes. After conductors are wired to an electrical device, it and the attached conductors are pushed into the electrical box and the device is attached to the top and bottom of the box with screws. During a trim phase, face plates are mounted over the open-end of the electrical boxes, completing the standard electrical wiring process.

SUMMARY OF THE INVENTION

Standard AC electrical systems are problematic in construction and use, with respect to costs, safety and functionality. From an electrical contractor perspective, a journeyman electrician must make two separate trips to the job site, one for the rough phase and one for the makeup phase. Also, during the makeup phase, installation of the wall panels can damage the work completed during the rough phase. This occurs, for example, when a router contacts exposed cables as drywallers create a hole to accommodate electrical box openings. Another form of damage occurs when drywall compound or paint fouls the exposed cables, insulation and labeling.

From a general contractor's perspective, verification of the electrical contractor's work is not possible until after the makeup phase. Until then, the electrical cables are unterminated. After the makeup phase, however, miswiring typically requires cutouts in the installed wall panels and associated patches after corrections are completed. Further, the electrical system cannot be activated until after verification. Thus, during the rough and makeup phases, electricity for tools and lighting must be supplied by generators, which create hazards due to fumes, fuel, and noise and are an unreliable electrical source. In addition, until the trim phase is completed, unskilled personnel have access to the electrical

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cable. Tampering can compromise the integrity of the electrical wiring and also create a safety problem after power is activated.

From a homeowner's perspective, there are problems with repair of the standard electrical wiring. Replacement of a broken outlet or switch device first requires removal of a face plate. The screws that attach the module to the top and bottom of the electrical box must be removed next. The device is then removed from the box and the conductors are removed by loosening the screws on the outlet sides. The process is then reversed to attach the conductors to a new device and mount the new device into the electrical box.

The prior art electrical device replacement procedure described above exposes the homeowner to AC wiring upon removal of the face plate. This exposure creates a shock hazard. Further, a homeowner's reluctance to change out broken devices or to spend the money to hire an electrician also creates a shock and a fire hazard from continued use of cracked, broken or excessively worn outlets or switches. In addition, the integrity of the original wiring becomes questionable if a homeowner or other third party removes and replaces an electrical device. Miswiring by a third party can violate building codes and create shock and fire hazards, such as inadvertently switching the hot and neutral conductors, failing to attach ground wires, kinking or nicking conductors or improperly tightening connections.

An electrical distribution wiring module benefits the electrical contractor in several respects. The wiring module is installed internally to an electrical box and associated functional modules are removably installed into the wiring module without exposure to or access to electrical system wiring attached behind the panel. The journeyman's work can complete at the rough phase, when installation of the wiring module is complete. Thus, there is no need for the journeyman to return to the job site during the makeup phase because any semi-skilled laborer can insert, for example, an appropriate outlet or switch module. Further, there is no wiring access after the rough phase, protecting wiring integrity. Also, there are no exposed conductors or parts inside the electrical box that can be inadvertently damaged during wall panel installation.

An electrical distribution wiring module also benefits the general contractor. Because wiring is completed during rough framing, verification and activation of the building electrical system can be performed at the rough phase. Miswiring can be corrected before wall panels are installed and painted, eliminating cut and patch repairs. Early electrical system activation eliminates the need to use generators. Lack of third party access to the journeyman's wiring preserves integrity after verification and eliminates shock exposure to other workers.

An electrical distribution wiring module also benefits the homeowner. Replacement of broken sockets and switches can be easily and safely accomplished. Safety is enhanced by reducing exposure to electrical wiring and encouraging replacement of defective outlets and switches. Further, maintenance costs are reduced by reducing the need to hire an electrician for repairs. Wiring integrity is insured by reducing the opportunity of unqualified third parties to access the electrical system.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A-B are perspective views of an outlet module installed and removed, respectively, from a corresponding wiring module;

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FIGS. 2A-B are perspective views of a switch module installed and removed, respectively, from a corresponding wiring module;

FIGS. 3-8 are perspective views of an outlet module and outlet module components;

FIGS. 3A-B are front and back perspective views, respectively, of an outlet module;

FIGS. 4A-B are exploded, front perspective views of outlet modules;

FIGS. 5A-B are front and back perspective views, respectively, of an outlet module front cover;

FIGS. 6A-B are front and back perspective views, respectively, of an outlet module back cover;

FIGS. 7A-B are front and back perspective views, respectively, of an outlet module power contact set;

FIGS. 8A-B are front and back perspective views, respectively, of an outlet module ground contact set;

FIGS. 9-15 are perspective views of a switch module and switch module components;

FIGS. 9A-B are front and back perspective views, respectively, of a switch module;

FIG. 10 is an exploded, front perspective view of a switch module;

FIGS. 11A-B are front and back perspective views, respectively, of a switch module switch;

FIGS. 12A-B are front and back perspective views, respectively, of a switch module front cover;

FIGS. 13A-B are front and back perspective views, respectively, of a switch module single-pole, single throw (SPST) contact set;

FIGS. 13C-D are front and back perspective views, respectively, of a switch module single-pole, double throw (SPDT) contact set;

FIGS. 13E-F are front and back perspective views, respectively, of a switch module double-pole, double throw (DPDT) contact set;

FIGS. 14A-B are front and back perspective views, respectively, of a switch module actuator;

FIGS. 15A-B are front and back perspective views, respectively, of a switch module back cover;

FIGS. 16-22 are perspective views of a wiring module and wiring module components;

FIGS. 16A-B are front and back perspective views, respectively, of a terminal-block wiring module;

FIGS. 16C-D are back perspective views of a terminal-block wiring module and associated terminal guards in open positions;

FIGS. 16E-F are front and back views, respectively, of a terminal-block wiring module and position-dependent wiring labels;

FIGS. 16G-H are switch and outlet wiring schematics, respectively;

FIG. 17A-B are exploded, front perspective views of a terminal-block wiring module with stationary-mount and swivel-mount terminal guards, respectively;

FIGS. 18A-B are front and back perspective views and a back view, respectively, of a wiring panel;

FIGS. 19A-B are front and back perspective views, respectively, of a mounting bracket;

FIGS. 20A-B are front and back perspective views, respectively, of a wiring panel front cover;

FIG. 21 is a perspective view of a wiring panel terminal set;

FIGS. 22A-B are front and back perspective views, respectively, of a wiring panel back cover;

FIGS. 23A-B are front and back perspective views, respectively, of a dimmer switch module;

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FIG. 24 is an exploded, front perspective view of a dimmer switch module;

FIGS. 25A-B are front and back perspective views, respectively, of a fixed-wire wiring module;

FIGS. 26A-B are exploded, front and back perspective views, respectively, of a fixed-wire wiring module;

FIGS. 27A-B are front and back perspective views, respectively, of an electrical box cover;

FIGS. 28A-B are front perspective views of a covered and uncovered electrical box, respectively;

FIG. 29 is a front perspective view of a 2-gang electrical box with overlapping covers;

FIGS. 30A-B are back perspective and back perspective exploded views, respectively, of a wiring module having a terminal shield; and

FIGS. 31A-B are front and back perspective views, respectively, of a terminal shield;

FIGS. 32A-B are front and back perspective views, respectively, of a sealed wire wiring module; and

FIGS. 33A-B are exploded front and back perspective views, respectively, of a sealed wire wiring module.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

System Overview

FIGS. 1-2 illustrate a safety module electrical distribution system 100 having a functional module 110 and a wiring module 1600. The electrical distribution system 100 is configured to mount within a standard electrical box (not shown), such as is typically installed within a building wall. In particular, the wiring module 1600 is configured to be easily installed within an electrical box, and a functional module 110 is configured to be removably plugged into the wiring module 1600, as described below. FIGS. 1A-B show an outlet module 300 in an installed and a removed position, respectively. FIGS. 2A-B show a switch module 900 in an installed and a removed position, respectively. A face plate (not shown) may be installed over a functional module 110 so as to provide an aesthetic trim.

As shown in FIGS. 1-2, each functional module 110 provides a user-accessible electrical distribution function. As shown in FIGS. 1A-B, the functional module 110 may be an outlet module 300, which functions to supply a user with electrical power through a conventional AC plug inserted into one of the module sockets. The outlet module 300 is configured for installation in a ground-up position in a wiring module 1600 oriented for outlet installation. Alternatively, an outlet module and wiring module can be configured for outlet installation in a ground-down position.

As shown in FIGS. 2A-B, the functional module 110 may be a switch module 900, which allows a user to control electrical power to an outlet, a light or any of various electrical devices (not shown) by actuating the module switch. The switch is slideable between first and second positions in contrast to a conventional toggle switch, such as used for turning an interior light on and off. The switch module 900 is configured for installation in a wiring module 1600 oriented for switch installation. Reversible wiring module 1600 orientation within an electrical box to indicate the module to be installed and its proper orientation is described in detail with respect to FIGS. 16A-H, below.

Other outlet and switch related functional modules 110 may include GFCI outlets, covered safety outlets and dimmer switches (FIGS. 23-24) to name just a few. Further, the electrical distribution system 100 may be wall-mounted,

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ceiling-mounted or floor-mounted. In additional, the electrical distribution system 100 can be adapted for uses other than building electrical distribution, such as airplane, automobile or boat electrical distribution applications, to name a few. A modular electrical outlet and switch system is described in U.S. Pat. No. 6,341,981 entitled Safety Electrical Outlet and Switch System, and a covered safety outlet module is described in U.S. patent application Ser. No. 10/737,713 entitled Safety Outlet Module, both assigned to ProtectConnect, Irvine, Calif. and incorporated by reference herein.

Outlet Module

FIGS. 3A-B illustrate an outlet module 300 having a body 310, a front side 301 and a back side 302. The body 310 accepts attachment screws 305 on diagonally opposite corners that are utilized to secure the outlet module 300 to a wiring module 1600 (FIGS. 1A-B). The outlet module front side 301 provides upper and lower sockets 320 each configured to accept a conventional, three-wire (grounded) electrical plug. The outlet module back side 302 provides shielded plugs 330 and a ground bar 834 that physically and electrically connect the outlet module 300 to a wiring module 1600 (FIGS. 1A-B). The shielded plugs 330 transfer electrical power to the sockets 320, and the ground bar 834 provides a ground path for the sockets 320. The ground bar 834 also functions as a key to assist in orienting the outlet module 300 relative to the wiring module 1600 (FIGS. 1A-B).

FIG. 4A illustrates an outlet module 300 having a front cover 500, a rear cover 600, a power contact set 700 and a ground contact set 800. The front cover 500 and back cover 600 form the outlet module body 310 (FIGS. 3A-B). The covers 500, 600 advantageously snap together with a latch and catch assembly, described with respect to FIGS. 5-6, below. This reduces manufacturing assembly steps and reduces or eliminates the need for separate fasteners, such as rivets or screws and/or sonic welding. The contact set 700, 800 is retained within the covers 500, 600 and provides conductive paths from the wiring panel 1600 (FIGS. 16A-B) to the outlet sockets 320 (FIG. 3A). In particular, a power contact set 700 transfers power from the shielded plugs 330 (FIG. 3B) to the outlet sockets 320 (FIG. 3A). A ground contact set 800 provides a ground path between a ground bar 834 (FIG. 3B) and the outlet sockets 320 (FIG. 3A). The ground contact set components 810, 830, 850 are assembled as described with respect to FIGS. 8A-B, below. In one embodiment, the covers 500, 600 are constructed of nylon. FIG. 4B illustrates an alternative embodiment of an outlet module 400, such as for 20A applications.

FIGS. 5A-B illustrate the outlet module front cover 500 having an outside face 501, an inside face 502, outlet apertures 510, attachment ears 520, side latches 530 and contact housing structure 540, 550. As shown in FIG. 5A on the outside face 501, the outlet apertures 510 form the entry to the outlet module sockets 320 (FIG. 3A) and include a hot slot, neutral slot and ground hole for each of a top socket and bottom socket. The attachment ears 520 are advantageously integral to the front cover 500, eliminating the need for a separate mechanism for attaching the outlet module 300 (FIGS. 3A-B) to the wiring module 1600 (FIGS. 16A-B). The attachment ears 520 are located at an upper right corner and a diagonally opposite lower left corner (not visible), and each has a fastening aperture that accepts, for example, an attachment screw 305 (FIGS. 3A-B). The side latches 530 form the front cover portion of the latch and catch assembly, functionally described with respect to FIG. 4, above.

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As shown in FIG. 5B on the inside face 502, a power contact structure 540 accepts the power contact set 700 (FIGS. 7A-B) so that the power contact clips 701 (FIGS. 7A-B) align with the hot and neutral slots of the outlet apertures 510. A ground contact structure 550 accepts the ground contact set 800 (FIGS. 8A-B) so that the ground contact clips 832, 852 (FIGS. 8A-B) align with the ground holes of the outlet apertures 510.

FIGS. 6A-B illustrate the outlet module back cover 600 having an outside face 601, an inside face 602, plug shields 610, a ground bar aperture 620, side catches 630 and contact support structure 640, 650. As shown in FIG. 6B on the outside face 601, the plug shields 610 advantageously provide the shield portion of the shielded plugs 330 (FIG. 3B). Specifically, the plug shields 610 completely surround all sides of the power contact set prongs 702 (FIGS. 7A-B). In this manner, the prongs 702 (FIGS. 7A-B) are not exposed when the outlet module plugs 330 (FIG. 3B) are engaged with the wiring module sockets 810 (FIG. 18A), even when the outlet module 300 (FIGS. 3A-B) is partially separated from the wiring module 1600 (FIGS. 16A-B). The ground bar aperture 620 allows the ground bar 834 (FIGS. 8A-B) to protrude through the back cover 600, providing a ground contact with the wiring module 1600 (FIGS. 16A-B). The side catches 630 provide apertures that accept and engage the side latches 530 (FIGS. 5A-B) so as to releasably secure together the front cover 500 (FIGS. 5A-B) and the back cover 600.

As shown in FIG. 6A on the inside face 602, a power contact support structure 640 consists of slots that allow the prongs 702 (FIGS. 7A-B) to protrude through the back cover 600 within the plug shields 610, providing a power connection with the wiring module 1600 (FIGS. 16A-B). A ground contact support structure 650 supports the ground contact set 800 (FIGS. 8A-B).

FIGS. 7A-B illustrate the power contact set 700 having an upper hot contact 710, a lower hot contact 720, an upper neutral contact 730 and a lower neutral contact 740. Each contact 710-740 has a prong clip 701 interconnected with a prong 702. The prong clips 701 align with the front cover hot and neutral slots 510 (FIG. 5A) to form the outlet module sockets 320 (FIG. 3A). The prongs 702 insert through the power contact support structure 640 into the plug shields 610 to form the outlet module shielded plugs 330 (FIG. 3B). Advantageously, the power contact set 700 is configured so that the contacts may be manufactured by a stamp and fold process. In one embodiment, the contacts are brass.

FIGS. 8A-B illustrate a ground contact set 800 having a ground buss 810, an upper ground contact 830 and a lower ground contact 850. The ground clips 832, 852 align with the front cover ground holes 510 (FIG. 5A) to form the ground portion of the outlet module sockets 320 (FIG. 3A). The ground bar 834 protrudes through the back cover 600 (FIGS. 6A-B) to provide a ground path connection with the wiring module 1600 (FIGS. 16A-B). The unassembled ground contact set 800 is illustrated in FIG. 4, above. Ground contact set 800 assembly is described below.

As shown in FIGS. 8A-B, the ground buss 810 has a upper rivet 812, a lower rivet 814, an upper cutout 815, a slot 816 and a lower cutout 818. The ground buss 810 mechanically supports and electrically interconnects the upper ground contact 830 and the lower ground contact 850. The upper ground contact 830 has an upper ground clip 832, a ground bar 834, leaves 836 and a tab 838. The upper ground clip 832 and ground bar 834 extend from opposite ends of the upper ground contact 830. The upper ground clip 832 accepts a ground pin from a standard AC electrical plug. The

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ground bar 834 inserts into a corresponding ground clip 1902 (FIGS. 19A-B) in the wiring module 1600 (FIGS. 16A-B). The tab 838 extends generally perpendicularly below and between the clip 832 and bar 834 and has an aperture corresponding to the top rivet 812. The leaves 836 extend from the back of the clip 832. The lower ground contact 850 has a lower ground clip 852, leaves 854 and a tab 858. The tab 858 extends generally perpendicularly to the clip 852 and has an aperture corresponding to the lower rivet 814. The leaves 854 extend from the back of the clip 852.

Also shown in FIGS. 8A-B, the ground contact set 800 is assembled by inserting the upper ground contact 830 and lower ground contact 850 into the ground buss 810. Specifically, the ground bar 834 is inserted into the slot 816, the leaves 836, 854 are inserted into the upper and lower cutouts 815, 818, respectively, the upper and lower rivets 812, 814 are inserted through the tabs 838, 858. The rivets 812, 814 are then splayed, fixedly attaching the upper and lower ground contacts 830, 850 to the ground buss 810. Advantageously, the ground contact set 800 is configured so that the ground contact set components 810, 830, 850 may be manufactured by a stamp and fold process. In one embodiment, the upper and lower ground contacts 830, 850 are brass and the ground buss 810 is zinc-plated steel.

Switch Module

FIGS. 9A-B illustrate a switch module 900 having a body 910, a front side 901 and a back side 902. Like the outlet module body 310 (FIGS. 3A-B), the switch module body 910 accepts screws on diagonally opposite corners that are utilized to secure the switch module 900 to a wiring module 1600 (FIGS. 2A-B). The switch module front side 901 has a slideable switch 1100 configured to actuate internal contacts so as to route electrical power, to turn on and off a light, for example. Like the outlet module 300 (FIGS. 3A-B), the switch module back side 902 provides shielded plugs 930 that physically and electrically connect the switch module 900 to a wiring module 1600 (FIGS. 2A-B). The shielded plugs 930 conduct electrical power under control of the switch 1100. There may be null plugs 940 having no conductors depending on the switch module 900 configuration and associated function, as described with respect to FIGS. 13A-F, below. The switch module 900 does not require a ground path to the wiring module 1600 (FIGS. 2A-B). A key bar 1520, therefore, provides a non-conducting structure that substitutes for a ground bar 834 (FIG. 3B), to assist in orienting the switch module 900 relative to the wiring module 1600 (FIGS. 2A-B).

FIG. 10 illustrates a switch module 900 having a switch 1100, a front cover 1200, a rear cover 1500, a contact set 1300, an actuator 1400 and a spring 1000. The front cover 1200 and back cover 1500 form the switch module body 910 (FIGS. 9A-B). The covers 1200, 1500 advantageously snap together and are secured with a latch and catch assembly, described with respect to FIGS. 12A-B and 15A-B, below. This reduces manufacturing assembly steps and reduces or eliminates the need for separate fasteners, such as rivets or screws and/or sonic welding. In one embodiment, the covers 1200, 1500 are constructed of nylon.

As shown in FIG. 10, the switch 1100 snaps into and is slidably retained by the front cover 1200 and engages the actuator 1400. The switch 1100 is movable between a first position and a second position. The contact set 1300, actuator 1400 and spring 1000 are retained within the covers 1200, 1500. The contact set 1300 routes electrical power from the wiring panel 1600 (FIGS. 1A-B) as determined by

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the switch 1100 positions. In particular, the position of the switch 1100 determines the position of the actuator 1400, which, in turn, determines whether the contact set 1300 is open or closed. If closed, the contact set 1300 provides a conductive path that transfers power between the shielded plugs 930 (FIG. 3B). The switch 1100 remains in its manually set position under tension from the spring 1000.

FIGS. 11A-B illustrate a switch 1100 that is generally rectangular, having a front side 1101 and a back side 1102. The front side 1101 has a finger grip 1110 for manually sliding the switch between its first position and its second position, as described above. The back side 1102 has latches 1120 and a lever 1130 that extends in a direction generally normal to the plane of the back side 1102. The latches 1120 are configured to pass through front cover slots 1214 (FIG. 12A), which cause the latches 1120 to flex inward toward the extension 1130 as the switch 1100 is pressed into the front cover 1200 (FIGS. 12A-B). The latches 1120 spring outward after the latches pass through the slots 1214 (FIG. 12A), seating the switch in the front cover 1200 (FIGS. 12A-B), as described below. The lever tip 1132 inserts through the actuator slot 1410 (FIGS. 14A-B) and contacts the spring 1000, mechanically connecting the switch 1100 to the actuator 1400 (FIGS. 14A-B).

FIGS. 12A-B illustrate a front cover 1200 having an outside face 1201, an inside face 1202, a switch cavity 1210, attachment ears 1220, side latches 1230 and top and bottom catches 1240. Located on the outside face 1201, the cavity 1210 is configured to accommodate the switch 1100 (FIGS. 1A-B). Within the cavity 1210 is a lever slot 1212 that allows the switch lever 1130 (FIG. 11B) to pass through the front cover to the actuator 1400 (FIGS. 14A-B). The lever slot 1212 extends along the cavity 1210 a sufficient distance to allow switch movement between first and second positions, as described above. Also within the cavity 1210 are catch slots 1214 that accommodate and capture the switch latches 1120 (FIG. 11B), as described above. The attachment ears 1220 are located at an upper right corner and a diagonally opposite lower left corner (not visible), and each has a fastening aperture that accepts, for example, an attachment screw 305 (FIGS. 3A-B). The side latches 1230 and top and bottom catches 1240 form the front cover portion of the latch and catch assembly, functionally described with respect to FIG. 10, above.

FIGS. 13A-B illustrate a SPST contact set 1300 having a throw buss 1310 and a pole buss 1320. The throw buss 1310 has a first prong 1312, a flexible throw 1314 and a throw contact 1318. The pole buss 1320 has a second prong 1322, a fixed pole 1324 and a pole contact 1328. The first and second prongs 1312, 1322 form the conductive portion of the shielded plugs 930 (FIG. 9B). The flexible throw 1314 engages the actuator 1400, as described with respect to FIGS. 14A-B, below, which moves the throw between an open position and a closed position (shown). In the closed position, the throw contact 1318 touches and electrically connects with the pole contact 1328, establishing a conductive path between the first and second prongs 1312, 1322. In the open position, the throw contact 1318 is separated from the pole contact 1328 so that there is no conductive path between the first and second prongs 1312, 1322.

FIGS. 13C-D illustrate a SPDT contact set 1301 for a 3-way switch having a second pole buss 1330 in addition to the SPST contact set 1300 (FIGS. 13A-B). The second pole buss 1330 has a third prong 1332 and a second pole contact 1338. The flexible throw 1314 engages the actuator 1400, as described with respect to FIGS. 14A-B, below, which moves the throw between a first position (shown) and a

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second position. In a first position, the throw contact 1318 touches and electrically connects with the pole contact 1328, establishing a conductive path between the first and second prongs 1312, 1322. In a second position, the throw contact 1318 touches and electrically connects with the second pole contact 1338, establishing a conductive path between the first and third prongs 1312, 1332.

FIGS. 13E-F illustrate a DPDT contact set 1302 for a 4-way switch having a second throw buss 1340 and a third pole buss 1350 in addition to the SPDT contact set 1301. The second throw buss 1340 has a second flexible throw 1344. The second throw buss 1340 has a fourth prong 1342, a second flexible throw 1344 and a second throw contact 1348. The second pole buss 1330 has the third pole contact 1339, and the third pole buss 1350 has a fourth pole contact 1359. In a first position, the throw contact 1318 touches and electrically connects with the pole contact 1328, establishing a conductive path between the first and second prongs 1312, 1322. Also, the second throw contact 1348 touches and electrically connects with the third pole contact 1339, establishing a conductive path between the third and fourth prongs 1332, 1342. In a second position, the throw contact 1318 touches and electrically connects with the second pole contact 1338, establishing a conductive path between the first and third prongs 1312, 1332. Also, the second throw contact 1348 touches and electrically connects with the fourth pole contact 1339, establishing a conductive path between the second and fourth prongs 1322, 1342.

FIGS. 14A-B illustrate an actuator 1400 having a front face 1401, a back face 1402 and a lever slot 1410 generally centered within and passing through the front and back faces 1401, 1402. The actuator 1400 is positioned within the switch module 900 (FIG. 10) so that the front face 1401 is proximate the front cover 1200 (FIG. 10) and the contact set 1300 (FIG. 10) and the back face 1402 is proximate the spring 1000 (FIG. 10) and the back cover 1500 (FIG. 10). The lever slot 1410 accommodates the switch lever tip 1132 (FIG. 11B), as described above. The front face 1401 has a pair of upper arms 1420 and a pair of lower arms 1430 extending generally perpendicularly from the front face 1401 so as to engage the contact set 1300 (FIGS. 13A-B). In particular, the flexible throw 1314 (FIGS. 13A-B) is engaged between the upper arms 1420. For a DPDT contact set 1302 (FIGS. 13E-F), a second flexible throw 1344 (FIGS. 13E-F) is engaged between the lower arms 1430. The back face 1402 has a pair of posts 1440 that are slidably retained within back cover guides 1550 (FIG. 15A).

FIGS. 15A-B illustrate a rear cover 1500 having an inside face 1502, an outside face 1501, plug shields 1510, a key bar 1520, side catches 1530, top and bottom latches 1540, actuator guides 1550, a spring hold 1560 and contact support structure 1570. As shown in FIG. 15B on the outside face 1501, the plug shields 1510 advantageously provide the shield portion of the shielded plugs 930 (FIG. 9B). Specifically, the plug shields 1510 completely surround all sides of the contact set prongs 1312, 1322 (FIGS. 13A-B). In this manner, the prongs are not exposed when the switch module plugs 930 (FIG. 9B) are engaged with the wiring module sockets 1810 (FIG. 18A), even when the switch module 900 (FIGS. 9A-B) is partially separated from the wiring module 1600 (FIGS. 16A-B). The key bar 1520 is configured to insert into the wiring module ground socket 1820 (FIG. 18A), although the key bar 1520 is nonconductive. The key bar 1520 assists proper orientation of the switch module 900 (FIGS. 9A-B) to the wiring module 1600 (FIGS. 16A-B). The side catches 1530 provide apertures that accept and engage the side latches 1230 (FIGS. 12A-B), and the top

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and bottom latches 1540 insert into and engage the top and bottom catches 1240 (FIGS. 12A-B) so as to releasably secure together the front cover 1200 (FIGS. 12A-B) and the back cover 1500.

As shown in FIG. 15A on the inside face 1502, the actuator guides 1550 slidably retain the actuator posts 1440 (FIG. 14B). The spring hold 1560 accommodates and retains the spring 1000 (FIG. 10). The contact support structure 1570 consists of slots through the back cover 1500 and structure extending generally normal to the inside face 1502 that support the contact set 1300 (FIGS. 13A-B). The slots accept the contact set prongs 1312, 1322 (FIGS. 13A-B), which protrude through the back cover 1500 within the plug shields 1510.

Terminal-Block Wiring Module

FIGS. 16A-B illustrate a terminal-block wiring module 1600 having a functional side 1601 and a wiring side 1602. The functional side 1601 has structured sockets 1810 and an off-center ground socket 1820. The structured sockets 1810 accept corresponding functional module shielded plugs, as described with respect to FIG. 20A, below. The wiring module 1600 is configured to mount within a conventional electrical box (not shown), secured with attachment screws 1605. A functional module, such as an outlet module 300 (FIGS. 3A-B) or a switch module 900 (FIGS. 9A-B) plug into the wiring module functional side 1601, secured to the wiring module with attachment screws that thread through attachment ears and corresponding module mounts 1930, as described with respect to FIGS. 1-2, above. A power cable (not shown) routed into the electrical box attaches to a terminal block 1640 (FIG. 16F) accessible from the wiring module wiring side 1602, as described with respect to FIGS. 16E-H, below.

As shown in FIGS. 16A-B, a wiring module 1600 advantageously can be installed, wired and tested by journeyman electrician at the rough-in phase of building construction. The wiring module 1600 is mounted within an electrical box according to the type of functional module for which the wiring module 1600 will be wired. If the wiring module 1600 is mounted in a first orientation (FIG. 1B), the ground socket 1820 is positioned below-center. If the wiring module is mounted in a second orientation (FIGS. 2B, 16A), the ground socket 1820 is positioned above-center. The ground socket 1820 accepts an outlet module ground bar 834 (FIG. 3B) or switch module key bar 1520 (FIG. 9B), which act as keys. Correspondingly, the ground socket 1820 acts as a block that accepts a functional module key 834 (FIG. 3B), 1520 (FIG. 9B) only when the functional module is properly oriented with respect to the wiring module 1600 according to module type, such as a switch or outlet. In one embodiment, the wiring module 1600 is mounted with the ground socket 1820 above-center for a switch module 900 (FIGS. 9A-B) and mounted with the ground socket 1820 below-center for an outlet module 300 (FIGS. 3A-B), as described in further detail with respect to FIGS. 16E-H, below.

FIGS. 16C-D illustrate a terminal-block wiring module 1600 having terminal guards 1700 that advantageously provide covered access to the terminal set 2100 (FIG. 21). In particular, in a closed position (FIGS. 16A-B) the terminal guards 1700 protect users from shock and insulate between closely mounted high voltage devices. In an open position (FIGS. 16C-D), the terminal guards 1700 allow convenient access to the terminal screws 2140 so as to attach or remove power cable wires from the terminal blocks 1640. As shown in FIG. 16C, a hinge 1702 allows a terminal guard 1700 to move from a closed position FIGS. (16A-B) to an open

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position. A latch 1704 presses into a corresponding catch slot 2220, which retains a terminal guard 1700 in a closed position until it is manually opened. As shown in FIG. 16D, in one embodiment a swivel mount 1709 (FIG. 17B) also allows the terminal guard 1700 to swivel from side to side in an open position, further easing access to the terminal screws 2140.

FIGS. 16E–F illustrate orientation-dependent labels on the wiring module functional and wiring sides, respectively. As described above, the type of functional module to be mounted in the wiring module 1600 determines the mounted orientation of the wiring module 1600 within an electrical box. Color coded labels 1620, 1630 on the functional side (FIG. 16E) and wiring labels 1650, 1660 on the wiring side (FIG. 16F) advantageously indicate to the journeyman electrician the correct wiring module 1600 orientation. The color coded labels 1620, 1630 also advantageously indicate the correct functional module to be installed or replaced. In particular, as shown in FIG. 16E, the color coded labels include a switch label 1620 and an outlet label 1630. The switch label 1620 has an orientation indicator 1622 and corresponding text that specify the wiring module orientation for a switch module 900 (FIGS. 2A–B). In addition, color boxes 1624 advantageously match color indicators 2310 (FIG. 23A) on corresponding switch modules 900. Further, as shown in FIG. 16F, the outlet label 1630 has an orientation indicator 1632 and corresponding text that specify the wiring module orientation for an outlet module 300 (FIGS. 1A–B). Also, color boxes 1634 match an outlet color indicator. In one embodiment, the switch color boxes 1624 are yellow, red and orange matching SP, 3-way and 4-way switch color indicators, respectively. The outlet color boxes 1634 are dark and light blue for full hot and half-hot wiring, matching a blue color indicator for an outlet module. The color boxes 1624, 1634 are marked by the journeyman electrician at wiring module installation to visually indicate the module type for which the wiring module 1600 was wired.

As shown in FIG. 16F, there are four terminal blocks 1640, each having terminal labels “1,” “2,” “3” and “4” 1670 identifying the individual terminal blocks T1, T2, T3 and T4 by number. In a switch orientation (shown), switch labels 1650 are advantageously positioned in a manner visually corresponding to each of the individual terminal blocks 1640. The switch labels 1650 identify switch wiring for each terminal block by switch type SP, 3-way and 4-way. The outlet labels 1660 are upside down in the switch orientation, visually indicating that they are inapplicable. In an outlet orientation (upside down from that shown), outlet labels 1660 are similarly positioned in a manner visually corresponding to each of the individual terminal blocks 1640. The outlet labels 1660 identify outlet wiring. The switch labels 1650 are upside down in the outlet orientation, visually indicating that they are inapplicable.

FIGS. 16G–H illustrate switch and outlet wiring schematics, respectively, corresponding to the terminal labels 1670 (FIG. 16F), switch labels 1650 (FIG. 16F) and outlet labels 1660 (FIG. 16F) described with respect to FIG. 16F, above. Graphically depicted are groups of four terminals 1690 representing the terminal blocks 1640 (FIG. 16F). Also depicted are individual terminal blocks 1691, corresponding hot, neutral, traveler and switch wires 1692, and links and gaps 1693 corresponding to removable breakaways 2116.

FIGS. 17A–B illustrate a terminal-block wiring module 1600 having a wiring panel 1800 and a mounting bracket 1900. The wiring panel 1800 has a front cover 2000, a back cover 2200, a terminal set 2100 and terminal guards 1700.

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The front cover 2000 and back cover 2200 are secured together with a fastener (not shown). The mounting bracket 1900 further secures the front cover 2000 to the back cover, as described with respect to FIGS. 18–20, below. The terminal set 2100 is retained within the wiring panel 1800 and provides terminal blocks 1640 (FIG. 16F) for power cable attachment and provides conductive paths between the terminal blocks 1640 (FIG. 16F) and structured sockets 1810 (FIG. 18A). The mounting bracket 1900 advantageously performs multiple functions including securing the wiring module 1600 to an electrical box (not shown), securing together the front and back covers 2000, 2200, providing a ground bar clip 1902 (FIG. 19A) for contact with a module ground bar 834 (FIG. 3B) and providing a ground terminal 1907 (FIG. 19A) for a ground wire connection.

As shown in FIGS. 17A–B, the terminal guards 1700 each have a hinge 1702, a latch 1704, a mount 1706, 1709 and a grip 1708. The mount 1706, 1709 slides into a corresponding guard slot 2210 (FIG. 22A) on each side of the back cover 2200, which secures each terminal guard 1700 to the wiring panel 1800. The hinge 1702 advantageously allows a terminal guard 1700 to move between a closed position (FIGS. 16A–B) blocking inadvertent contact with the terminal blocks 1640 (FIG. 16F) and an open position (FIGS. 16C–D) allowing access to the terminal blocks 1640 (FIG. 16F). The latch 1704 presses into a corresponding catch slot 2220 (FIG. 22A) on each side of the back cover 2200, which retains each terminal guard 1700 in a closed position until it is manually opened. A grip 1708 assists in latching the terminal guards 1700. A stationary mount 1706 (FIG. 17A) holds the terminal guards 1700 in alignment with the terminal screws 2140 (FIG. 21). Alternatively, a swivel mount 1709 (FIG. 17B) advantageously allows the terminal guards 1700 to swivel to either side 1601, 1602 (FIGS. 16A–B) of the wiring module for easier access to the terminal screws 2140 (FIG. 21).

FIGS. 18A–B illustrate a wiring panel 1800 having a front side 1801 and a back side 1802. The front side 1801 has structured sockets 1810, a ground socket 1820 and bracket slots 1830. The back side 1802 has terminal blocks 1640 (FIG. 16F) formed by a terminal set 2100 (FIG. 21) having terminal screws 2140 (FIG. 21) that are accessed through the terminal guards 1700, as described above.

FIGS. 19A–B illustrate a mounting bracket 1900 having a bracket body 1901, a ground clip 1902 and a ground terminal 1907. The ground clip 1902 is attached to the bracket body 1901 with a rivet 1905. The ground terminal 1907 provides a ground termination for a ground wire (not shown). The bracket 1900 has swages 1910, box mounts 1920 and module mounts 1930. The bracket 1900 is configured to be disposed around the rear cover 2200 (FIGS. 22A–B) with the swages 1910 inserted through front cover slots 2020 (FIGS. 20A–B) and spread against the front cover outside 2001 so as to secure together the front and rear covers 2000, 2200. A fastener 1909 is inserted through the bracket and into the wiring panel front cover 2000, so as to secure together the front and rear covers 2000, 2200. The box mounts 1920 allow the wiring module 1600 (FIGS. 16A–B) to be secured to an electrical box (not shown) and are configured to removably engage a box cover (FIGS. 27–29). The module mounts 1930 allow functional modules 300 (FIGS. 3A–B), 900 (FIGS. 9A–B) to be secured to the wiring module 1600 (FIGS. 16A–B). The ground clip 1902 is configured to physically and electrically connect to a module ground bar 834 (FIGS. 8A–B).

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In an alternative embodiment, the mounting bracket 1900 does not have swages 1910. Multiple fasteners 1909 are inserted through the mounting bracket 1900 and into the wiring panel front cover 2000, so as to secure together the front and rear covers 2000, 2200. After the mounting bracket 1900 is attached to the front cover 2000, ears at the top and bottom of the mounting bracket 1900 are bent over and against the front cover outside 2001 to further secure together the front and rear covers 2000, 2200. Trusses are included across or proximate to folded portions of the mounting bracket 1900 to strengthen the bracket structure. The box mount 1920 may have an alternative shape so as to accommodate a box cover 2700 (FIGS. 27A-B).

FIGS. 20A-B illustrate a front cover 2000 having an outside face 2001 and an inside face 2002. As shown in FIG. 20A on the outside face 2001, raised guards 2010 and surrounding channels 2014 provide the nonconductive portions of structured sockets 1810 (FIG. 18A). Each raised guard 2010 and surrounding channel 2014 are configured to mate with a corresponding plug shield 610 (FIG. 6B). In particular, when a functional module is plugged into the wiring module 1600 (FIGS. 16A-B), shields 610 (FIG. 6B), 1510 (FIG. 15B) insert into channels 2014, guards 2010 insert within shields 610 (FIG. 6B), 1510 (FIG. 15B), and prongs 702 (FIGS. 7A-B) plug into power clips 2112 (FIG. 21). This interlocking action of the shield plugs 330 (FIG. 3B), 930 (FIG. 9B) and the structured sockets 1810 (FIG. 18A) advantageously provides a fully enclosed shield as an electrical connection is made between a functional module and a wiring module, in addition to tactile feedback and a solid mechanical and electrical connection. Further, the guards 2010 and channels 2014 reduce the chance of an inadvertent contact between a tool, such as a screwdriver tip, and a hot contact within a socket 1810 (FIG. 18A). For example, a tool dragged across the wiring panel front side 1801 (FIG. 18A) during service will tend to lodge in the channel 2014 or against the raised guard 2010 or both. In a particular embodiment, the shields 610 (FIG. 6B), 1510 (FIG. 15B) and the corresponding channels 2014 and raised guards 2010 are generally rectangular in shape with rounded corners.

As shown in FIG. 20B, the inside face 2002 has swage slots 2020, a ground aperture 2030 and terminal support structure 2050, 2060. The swage slots 2020 accommodate the mounting bracket swages 1910 (FIG. 19A), which assist to secure together the front and back covers 2000, 2200. The ground aperture 2030 accommodates a ground bar 834 (FIG. 3B) or key bar 1520 (FIG. 9B) as part of a ground socket 1820 (FIG. 18A). The support structure 2050, 2060 houses the terminal set 2100 (FIG. 21).

FIG. 21 illustrates a terminal set 2100 having contact busses 2110, terminal clamps 2130 and terminal screws 2140. The contact busses 2110 each have power clips 2112 that provide the conductor portion of the structured sockets 1810 (FIG. 18A). The power clips 2112 are configured to physically and electrically connect with module prongs 702 (FIGS. 7A-B), 1312, 1322 (FIGS. 13A-B). The terminal clamps 2130 and terminal screws 2140 terminate power cables (not shown) to the contact busses 2110. The terminal clamps 2130 are configured to secure one wire per channel 2132. Advantageously, this provides a four-wire capacity for each of four terminal blocks 1640 (FIG. 16F). In one embodiment, each terminal block 1640 (FIG. 16F) is configured for four 14 gauge copper wires or two 12 gauge copper wires. Breakaways 2116 are removable to selectively isolate individual terminal blocks 1640 (FIG. 16F).

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FIGS. 22A-B illustrate a back cover 2200 having an inside face 2202 and an outside face 2201. The inside face 2202 has mount slots 2210 and catch slots 2220 that retain the terminal guards 1700 (FIG. 17), as described above. The inside face 2202 also has terminal slots 2230 that retain the terminal set. The outside face 2201 is shaped to accommodate the mounting bracket 1900 (FIGS. 19A-B) and accommodate power cable attachment to the terminal blocks 1640 (FIG. 16F).

Dimmer Switch Module

FIGS. 23A-B illustrate a dimmer switch module 2300 having a switch 2410 and a dimmer lever 2460 on a front side 2301 and shielded plugs 2330 and a key bar 2350 on a back side 2302. The top of the switch module 2300 also has a color label 2310. The color label 2310 corresponds in color to one of the wiring module color labels 1624. In this manner, the switch module color label 2310 advantageously provides a visual indication of proper module orientation and avoids installation into a wiring module 1600 (FIG. 16B-F) wired for a different module type. Similar color labels of differing colors may be applied in a similar fashion to outlet modules 300 (FIGS. 3A-B) and other switch modules 900 (FIGS. 9A-B) for the same purpose. FIG. 24 illustrates the dimmer switch module 2300 including a switch 2410, a front cover 2420, a bracket 2430, a circuit board 2440, a back cover 2450 and a dimmer lever 2460.

Fixed-Wire Wiring Module

FIGS. 25A-B illustrate a fixed-wire wiring module 2500 having a functional side 2501 and a wiring side 2502. The wiring module 2500 is configured to mount within a conventional electrical box (not shown), secured with attachment screws (not shown) threaded through box mounts 2652. A functional module, such as an outlet module 300 (FIGS. 3A-B) or a switch module 900 (FIGS. 9A-B) plug into the wiring module functional side 2501, secured to the wiring module 2500 with attachment screws (not shown) that thread through attachment ears (not shown) and corresponding module mounts 2654, as described with respect to FIGS. 1-2, above. A power cable (not shown) routed to the electrical box attaches to pushwire connectors 2570 at the end of fixed wires 2550 extending from the wiring module wiring side 2502.

FIGS. 26A-B illustrate a fixed-wire wiring module 2500 having a front cover 2610, a back cover 2620, a terminal set 2630, a mounting bracket 2650, a ground bar clip 2660 and fasteners 2670. The front cover 2610 and back cover 2620 are secured together with the fasteners 2670 and enclose the terminal set 2632. Advantageously, the mounting bracket 2650 is partially enclosed by, and retained between, the front cover 2610 and back cover 2620 so as to secure the mounting bracket 2650 to, and mechanically and electrically integrate the mounting bracket with, the wiring module 2500.

As shown in FIGS. 26A-B the front cover 2610 has structured sockets 2612, a ground aperture 2614, support structure 2616 and fastener posts 2618. The structured sockets 2612 interlock with functional module shielded plugs and the ground aperture 2614 accommodates a ground bar or key bar as part of a ground socket in a manner as described with respect to FIGS. 20A-B, above. The support structure 2616 houses the terminal set 2630. The fastener posts 2618 align with fastener apertures 2624 and accept the fasteners 2670 securing the front cover 2610 to the back cover 2620.

Also shown in FIGS. 26A-B, the terminal set 2630 has power clips 2632, fixed wire terminals 2634 and breakaways

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2638. The power clips 2632 provide the conductor portion of the structured sockets 2612 and are configured to physically and electrically connect with module prongs in a manner as described with respect to FIG. 21, above. The fixed wire terminals 2634 electrically and mechanically connect a stripped end of the fixed wires 2550 (FIGS. 25A-B) to the terminal set 2630. The breakaways 2638 are removable to selectively isolate individual power clips 2632.

Further shown in FIGS. 26A-B, the mounting bracket 2650 is adapted to a channel extending lengthwise along the front cover 2610 and corresponding support structure extending lengthwise along the back cover 2620. The mounting bracket 2650 has box mounts 2652, module mounts 2654, a ground clip aperture 2656 and a ground terminal 2658. The box mounts 2652 accept fasteners (not shown) to secure the bracket to an electrical box (not shown). The module mounts 2654 accept fasteners (not shown) to secure a functional module (not shown) to the wiring module 2500. The ground clip aperture 2656 is adapted to the ground clip 2660, which connects a functional module ground bar electrically and mechanically to the bracket 2650. The bracket has an integrated rivet for securing the ground clip 2660 within the aperture 2656. The ground terminal 2658 electrically and mechanically connects a stripped end of a ground one of the fixed wires 2550 (FIGS. 25A-B) to the bracket 2650.

Additionally shown in FIGS. 26A-B, the back cover 2620 has wire apertures 2622, fastener apertures 2624 and a breakaway aperture 2626. The wire apertures 2622 are adapted to the fixed wires 2550 (FIGS. 25A-B) so as to provide a seal around and strain relief for the fixed wires and access to the terminal set 2630 and ground terminal 2658. The fastener apertures 2624 accept that portion of the fasteners 2670 that thread into or are otherwise secured to the fastener posts 2618. The breakaway aperture 2626 allows user access to the breakaways 2638 within an assembled wiring module 2500.

Electrical Box Cover

FIGS. 27A-B illustrate an electrical box cover 2700 having a generally planar cover plate 2710, clamps 2720, catches 2730, trusses 2740 and markers 2750. The cover plate 2710 has a front side 2701 and a back side 2702. The clamps 2720 are located, one each, generally centered on the top and bottom of the cover plate 2710 and extend generally perpendicularly from the back side 2702. The catches 2730 are apertures, one for each catch 2730, that are generally centered on the catches 2720 and extending along the juncture between the catches 2730 and the cover plate 2710. The trusses 2740 are protrusions on the cover plate 2740 that extend substantially along the length of the front side 2701, providing structural support to resist bending of the cover plate 2710. The markers 2750 are generally round protrusions on the front side 2701 of the cover plate 2740 located, one each, proximate the top and bottom of the cover plate 2740.

FIGS. 28A-B illustrate an electrical box 2800 that is covered and uncovered, respectively, by a box cover 2700, as described with respect to FIGS. 27A-B, above. The box cover 2700 removably mounts over the electrical box open face 2801 so as to prevent material such as plaster and paint from fouling the wiring module 1600 during the makeup phase of construction. Advantageously, the box cover 2700 mounts generally flush with the electrical box open face 2801 and, hence, generally flush with installed drywall so as not to interfere with drywall construction during the makeup phase. Drywall, once loosely positioned, can be pressed

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against the box cover 2700. In doing so, the markers 2750 dimple the drywall, advantageously marking the location of the electrical box 2800 so that drywall cutouts can be accurately made to accommodate the electrical box 2800.

As shown in FIGS. 28A-B, the box cover 2700 is installed on the box mounts 1920 of a wiring module 1600 mounted within the electrical box 2800. In particular, the clamps 2720 flex somewhat to slide over the box mounts 1920 until the box mounts 1920 insert into corresponding catches 2730. The box cover 2700 can be easily removed by flexing the clamps 2720 so that a box mount 1920 clears a corresponding catch 2730.

FIG. 29 illustrate a 2-gang electrical box 2900 with overlapping box covers 2700. The box covers 2700 are configured so that a first portion 2791 of one cover overlaps a second portion 2792 of another cover so as to prevent drywall related material from entering between the covers 2700 and fouling the electrical box 2900 interior.

Terminal Shield

FIGS. 30A-B illustrate a terminal-block wiring module 1600 having a terminal shield 3100 installed on a wiring side 1602 using fasteners 1909. The terminal shield 3100 advantageously prevents bare copper ground wires (not shown), which typically are connected between the ground terminal 1907 (FIG. 17A) and an electrical box (not shown), from inadvertently protruding through the back cover 2200 (FIG. 17A) and short circuiting the terminal set 2100 (FIG. 17A).

FIGS. 31A-B illustrate a terminal shield 3100 having a front side 3101, a back side 3102 and a spine 3105. Mounting ears 3110 extend from both ends of the spine 3105, and shield wings 3120 extend from both sides of the spine 3105. Breakaway guards 3130 extend from a central portion of each shield wing 3120. A V-shaped hinge 3135 extending across a portion of each breakaway guard 3130 allows the breakaway guards 3130 to flex somewhat to gain access for removal of one or both of the breakaways 2116 (FIG. 16F), as described with respect to FIGS. 16G-H, above. Mounting apertures 3140 are defined in the mounting ears 3110, wire apertures 3150 are defined in the shield wings 3120, and a bracket aperture 3160 is defined in a central portion of the spine 3105.

As shown in FIGS. 31A-B, the terminal shield 3100 is installed with the back side 3102 proximate the wiring module 1600 (FIG. 30A) and the front side 3101 distal the wiring module 1600 (FIG. 30A). In particular, the spine 3105 fits against the bracket 1900 and the bracket aperture 3160 accommodates protrusions due to the ground clip 1902 (FIG. 17A) or its associated fastener. The mounting apertures 3140 accept the fasteners 1909 (FIG. 30A), which also secure together the wiring module 1600 (FIG. 30A). The shield wings 3120 cover exposed portions of the terminal set 2100 (FIG. 17A), and the wire apertures 3150 accommodate wire ends that are connected to the terminal set 2100 (FIG. 17A).

Other Functional Modules

Although described above with respect to outlet and switch modules, the electrical distribution system may operate in conjunction with a variety of functional modules providing various electrical functions, such as security modules, data transfer modules, computing modules, home entertainment modules and intelligent home product modules to name a few. For example, a security module may incorporate a video camera or motion sensor. A data transfer module may incorporate data storage devices, wireless transceivers or AC power line transceivers. A computing module may incorporate a microprocessor, a data entry or

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display device, for example. A home entertainment module may work in conjunction with speakers, LCD panels or plasma TVs. A home product module, for instance, may incorporate a microcontroller and a wireless or an AC power line transceiver for appliance control.

Sealed Wiring Modules

FIGS. 32A–B illustrate a sealed wire wiring module 3200 having a functional side 3201 and a wiring side 3202. Advantageously, a shield 3360 is disposed proximate the wiring side 3202 and configured to seal the wiring module 3200 so as to protect electricians and users alike from inadvertent exposure to potentially hazardous electrical power. As shown in FIGS. 32A–B, the wiring module 3200 is mounted within a conventional electrical box (not shown) and secured with attachment screws (not shown) threaded through box mounts 3342. A functional module, such as an outlet module or a switch module plug into the wiring module functional side 3201, secured to the wiring module 3200 with attachment screws (not shown) that thread through attachment ears (not shown) and corresponding module mounts 3344. A power cable (not shown) routed to the electrical box attaches to push wire connectors 3270 at the end of fixed wires 3250 extending from the wiring module wiring side 3202.

FIGS. 33A–B illustrate a sealed wiring module 3200 having a front cover 3310, a centered open back cover 3320, a terminal set 3330, a mounting bracket 3340, a ground bar clip 3350, a shield 3360 and fasteners 3370. The front cover 3310 and back cover 3320 are secured together with the fasteners 3370 and enclose the terminal set 3330. The mounting bracket 3340 is partially enclosed by, and retained between, the front cover 3310 and back cover 3320 so as to secure the mounting bracket 3340 to, and mechanically and electrically integrate the mounting bracket 3340 with, the wiring module 3200.

As shown in FIGS. 33A–B, the front cover 3310 has structured sockets 3312, a ground aperture 3314, support structure 3316 and fastener posts 3318. The structured sockets 3312 interlock with functional module shielded plugs, and the ground aperture 3314 accommodates a ground bar or key bar. The support structure 3316 houses the terminal set 3330. The fastener posts 3318 align with fastener apertures 3324 and accept the fasteners 3370 securing the front cover 3310 to the back cover 3320.

Also shown in FIGS. 33A–B, the terminal set 3330 has power clips 3332, fixed wire terminals 3334 and breakaways 3338. The power clips 3332 provide the conductor portion of the structured sockets 3312 and are configured to physically and electrically connect with functional module prongs. The fixed wire terminals 3334 electrically and mechanically connect stripped ends of the fixed wires 3250 to the terminal set 3330. The fixed wires 3250 are adapted to transfer electrical power from the power cable to the terminal set 3330 and, hence, to the structured sockets 3312. The breakaways 3338 are removable to selectively isolate individual power clips 3332.

Further shown in FIGS. 33A–B, the mounting bracket 3340 is housed in a channel extending lengthwise along the front cover 3310 and corresponding support structure 60 extending lengthwise along the back cover 3320. The mounting bracket 3340 has box mounts 3342, module mounts 3344, a ground clip aperture 3346 and a ground terminal 3348. The box mounts 3342 accept fasteners (not shown) to secure the bracket to an electrical box (not shown). The module mounts 3344 accept fasteners (not shown) to secure a functional module (not shown) to the

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wiring module 3200. The ground clip aperture 3346 is adapted to the ground clip 3350, which connects a functional module ground bar electrically and mechanically to the bracket 3340. The bracket has an integrated rivet for securing the ground clip 3350 within the aperture 3346. The ground terminal 3348 electrically and mechanically connects a stripped end of a ground one of the fixed wires 3250 to the bracket 3340.

Additionally shown in FIGS. 33A–B, the back cover 3320 has wire apertures 3322, fastener apertures 3324 and breakaway apertures 3326. The wire apertures 3322 are adapted to the fixed wires 3250 so as to provide a seal around and strain relief for the fixed wires and access to the terminal set 3330 and ground terminal 3348. The fastener apertures 3324 accept those portions of the fasteners 3370 that thread into or are otherwise secured to the fastener posts 3318. The breakaway apertures 3326 allow access to the breakaways 3338 within an assembled wiring module 3200.

Further shown in FIGS. 33A–B, the shield 3360 is attached to the back cover 3320 so as to enclose the breakaway aperture 3326. That is, the back cover 3320 and shield 3360 combined completely enclose the terminal set 3330 at the wiring side 3202 (FIG. 32B) so that there are no exposed power conductors. The shield 3360 has a mounting wall 3362 and knockouts 3364. The mounting wall 3362 is disposed proximate the center of the shield 3360 and has extensions connecting both of the knockouts 3364. The knockouts 3364 extend generally perpendicularly from the mounting wall extensions. The mounting wall 3362 has a mounting hole 3366 accommodating a fastener 3380 so that the shield 3360 fixedly attaches to the back cover 3320. The knockouts 3364 are individually removable to provide access to the breakways 3338.

An electrical distribution wiring module has been disclosed in detail in connection with various embodiments. These embodiments are disclosed by way of examples only and are not to limit the scope of the claims that follow. One of ordinary skill in the art will appreciate many variations and modifications.

What is claimed is:

1. A wiring module adapted to mount within an electrical box, said wiring module comprising:
 - a functional side having sockets adapted to removably connect with a functional module;
 - a wiring side opposite said functional side;
 - a terminal set providing a conductive portion of said sockets and adapted to electrically connect with a power cable;
 - a shield disposed proximate said wiring side so as to seal said terminal set;
 - a front cover defining said functional side;
 - a back cover defining said wiring side;
 - a bracket configured to mount said wiring module to said electrical box;
 - a plurality of wire apertures defined by said back cover;
 - a plurality of fixed wire terminals disposed on said terminal set;
 - a plurality of fixed wires each having a stripped wire end and a connector end, each of said fixed wires extending through a corresponding one of said wire apertures so that said stripped wire end connects to a corresponding one of said fixed wire terminals, said connector end adapted to terminate at least a portion of said power cable,
- wherein said covers attach together so as to enclose at least a portion of said terminal set and to secure said bracket, and

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wherein said shield comprises:

- a mounting wall disposed proximate a center of said shield;
- a mounting aperture defined in said mounting wall capable of accommodating a fastener so as to fixedly attach said shield to said back cover; and
- a plurality of knockouts extending from said mounting wall.

2. The wiring module according to claim 1 wherein: said knockouts are capable of removal so as to access breakaway portions of said terminal set, said breakaway portions capable of removal to electrically isolate portions of said sockets.

3. A wiring module comprising:

- a housing having a functional side with sockets adapted to removably connect with a functional module and an opposite wiring side;
- a terminal set disposed within said housing and forming a conductive portion of said sockets; and
- a plurality of wires extending through said wiring side each having a stripped end connected to said terminal set and a push-wire connector end adapted to attach to a power cable so that electrical power is communicated from said power cable to said sockets.

4. The wiring module according to claim 3 further comprising a plurality of breakaways disposed on said terminal set proximate said wiring side, said breakaways removable so as to electrically isolate portions of said terminal set.

5. The wiring module according to claim 4 further comprising a shield disposed proximate said wiring side so as to seal said terminal set.

6. The wiring module according to claim 5 wherein said shield comprises a plurality of knockouts removable from said shield so as to provide access to said breakaways.

7. The wiring module according to claim 6 wherein said housing further comprises a plurality of wire apertures each adapted for a corresponding one of said wires so as to provide a seal around and strain relief for said wires and access to said terminal set.

8. The wiring module according to claim 7 further comprising a bracket configured to mount said wiring module to an electrical box, said housing enclosing at least a portion of said bracket so as to secure said bracket to said housing.

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9. A wiring module adapted to an electrical box comprising:

- a front cover defining a functional side;
- a back cover defining a wiring side;
- a plurality of sockets disposed on said functional side adapted to connect to a functional module;
- a terminal set providing a conductive portion of said sockets;
- a plurality of push wire connectors accessible from said wiring side and in electrical communication with said terminal set, said push wire connectors adapted to connect to a power cable so as to transfer electrical power to said sockets;
- a shield disposed proximate said wiring side so as to seal said terminal set;
- a plurality of breakaways disposed on said terminal set proximate said wiring side, said breakaways removable so as to electrically isolate portions of said terminal set; and
- a plurality of wires extending through said wiring side each having a first end connected to said terminal set and a second end connected to one of said push wire connectors.

10. The wiring module according to claim 9 further comprising a plurality of wire apertures defined by said back cover and configured for a corresponding one of said wires so as to provide a seal around and strain relief for said wires and access to said terminal set.

11. The wiring module according to claim 10 further comprising a plurality of breakaway apertures defined by said back cover and that allow access to said breakaways, said shield configured to enclose said breakaway apertures.

12. The wiring module according to claim 11 wherein said shield comprises a plurality of knockouts removable from said shield so as to provide access to said breakaways.

13. The wiring module according to claim 12 further comprising a bracket, said bracket secured between said covers.

14. The wiring module according to claim 13 wherein said bracket has a plurality of module mounts adapted to secure said functional module to said wiring module.

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